

Charter School Performance in Ohio

2019

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Acknowledgments

CREDO gratefully acknowledges the support of the Ohio Department of Education, which contributed its data to this partnership. Our data access partnerships form the foundation of CREDO's work, without which studies like this would be impossible. We strive daily to justify the confidence you have placed in us.

CREDO gratefully acknowledges the support of the Thomas B. Fordham Institute for supporting this research.

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1. Introduction

Since the enactment of Ohio's charter school law in 1997, more than 600 public charter schools in Ohio have offered parents and students choices in their education. There have been controversies over charter schools. Supporters praise the autonomy that charter schools enjoy in adapting school designs to meet the needs of students, especially those in communities with historically low school quality. Opponents complain that charter schools take students and resources from district schools and further strain existing public schools' ability to improve. However, only a fraction of the debate is grounded in well-researched evidence about charter schools' impact on student outcomes.

This report provides evidence for charter students' performance in Ohio over four years of schooling, beginning with the 2013-2014 school year and ending in 2016-2017. During this window, Ohio's state assessments of reading and math underwent multiple changes. The Partnership for Assessment of Readiness for College and Careers (PARCC) was selected to produce statewide tests for administration in the school year 2014-2015, but Ohio then dropped PARCC in June 2015. The American Institutes for Research (AIR) replaced PARCC to provide Ohio's State Tests in spring 2016. Meanwhile, online testing was disseminated in the state.

In the policy space, the Ohio Senate and House passed the bipartisan House Bill 2 (HB 2) in October 2015, ushering in stricter charter school regulations. In particular, HB 2 forbids poorly rated sponsors from opening new schools and requires that "low-performing schools cannot escape accountability" when sponsors impose "sanctions (including probation, suspension, and up to termination or non-renewal of a contract)."¹ The data window of this study provides the ability to see if the updated charter school law (HB 2) has had any effect on overall charter school performance in Ohio.

With the cooperation of the Ohio Department of Education (ODE), CREDO obtained the historical sets of student-level administrative records. The support of ODE staff was critical to CREDO's understanding of the character and quality of the data we received. However, the entirety of interactions with the department dealt with technical issues related to the data. CREDO has developed the findings and conclusions presented here independently.

The study makes an in-depth examination of the academic outcomes for charter schools in Ohio. This current report has two main benefits. First, it provides a rigorous and independent view of the performance of the state's charter schools. Second, the study design is consistent with CREDO's reports on charter school performance in other locations, making the results amenable to benchmarking both nationally and in other locations.

In this report, we present the results from three sets of analysis. We first present findings about the impact of charter schools on student academic performance for the period 2013-2014 to 2016-2017. We

¹ Chad L. Aldis and Aaron Churchill, "Charter School Reform in Ohio: House Bill 2 at A Glance," Thomas B. Fordham Institute, October 7, 2015, <https://edexcellence.net/articles/charter-school-reform-in-ohio-house-bill-2-at-a-glance>.

show the results for the overall study sample, by school attributes, and for different student subgroups. These results are expressed in terms of the academic progress that a typical charter school student in Ohio would realize from a year of enrollment in a charter school. To help the non-technical reader grasp the findings, we translate the scientific estimates into estimated days of learning based on the foundation of a 180-day school year.

The second set of analyses scrutinizes average academic performance at the school level. Both legislation and public policy operate to influence school-level decisions. As such, the second set of findings looks at the performance of students by school and present school average results. These findings are important to understand the range of performance at the school level.

The third set of analyses examines the performance of charter schools grouped by operation type. In Ohio, as in the rest of the nation, a number of charter schools are affiliated with management organizations. We conduct analyses to discern whether there are differences between those schools that are part of management organizations and those charter schools that are independently operated. As online charter schools serve students with different characteristics and deliver curriculum differently from brick-and-mortar charters, we focus on brick-and-mortar charters when breaking down the charter impact by type of operation.

The findings show that in a year's time, the typical charter school student in Ohio makes similar progress in reading and weaker growth in math compared to the educational gains that the student would have made in a traditional public school (TPS). Thinking of a 180-day school year as "one year of learning," an average Ohio charter student experiences weaker annual growth in math equivalent to 41 fewer days of learning. Further probing reveals that enrollment in online charter schools is associated with substantially negative learning gains in both reading and math, which drags down the overall charter school impact on student progress. Greater academic progress is found for charter black students, including black students in poverty for reading, but not among other subgroups.

2. Study Approach

This study of charter schools in Ohio focuses on the academic progress (growth) of enrolled and tested students in Ohio's charter schools. Whatever else charter schools may provide their students, their contributions to students' readiness for secondary education, high school graduation, and post-secondary life remain of paramount importance. If charter schools do not succeed in forging strong academic futures for their students, they have failed in their mission. Furthermore, current data limitations prevent the inclusion of non-academic outcomes in this analysis.

To study academic performance of charter students in Ohio, we relied on scores students received on Ohio state standardized achievement tests, including grades 3-8 and end-of-course (EOC) assessments. Achievement tests capture what a student knows at a point in time. These test results were fitted into a bell curve format that enabled us to see how students moved from year to year in terms of academic

performance. Two successive test scores allow us to see how much progress a student makes over a one-year period; this is also known as a growth score or learning gain. Growth scores allow us to zero in on the contributions of schools separately from other things that affect point-in-time scores. The parsed effect of schools in turn gives us the chance to see how students' academic progress changes as the conditions of their education transform. This is the analytic foundation for our examination of the academic impact of enrollment in charter schools.

We employ the Virtual Control Record (VCR) method developed by CREDO in our analysis.² We strive to build a VCR for each charter school student. A VCR, or a “virtual twin,” is a synthesis of the actual academic experiences of up to seven students who are identical to the charter school student, except for the fact that the VCR students attend a TPS that each charter school's students would have attended if not enrolled in the charter school. This synthesized record is then used as the counterfactual condition to the charter school student's performance.

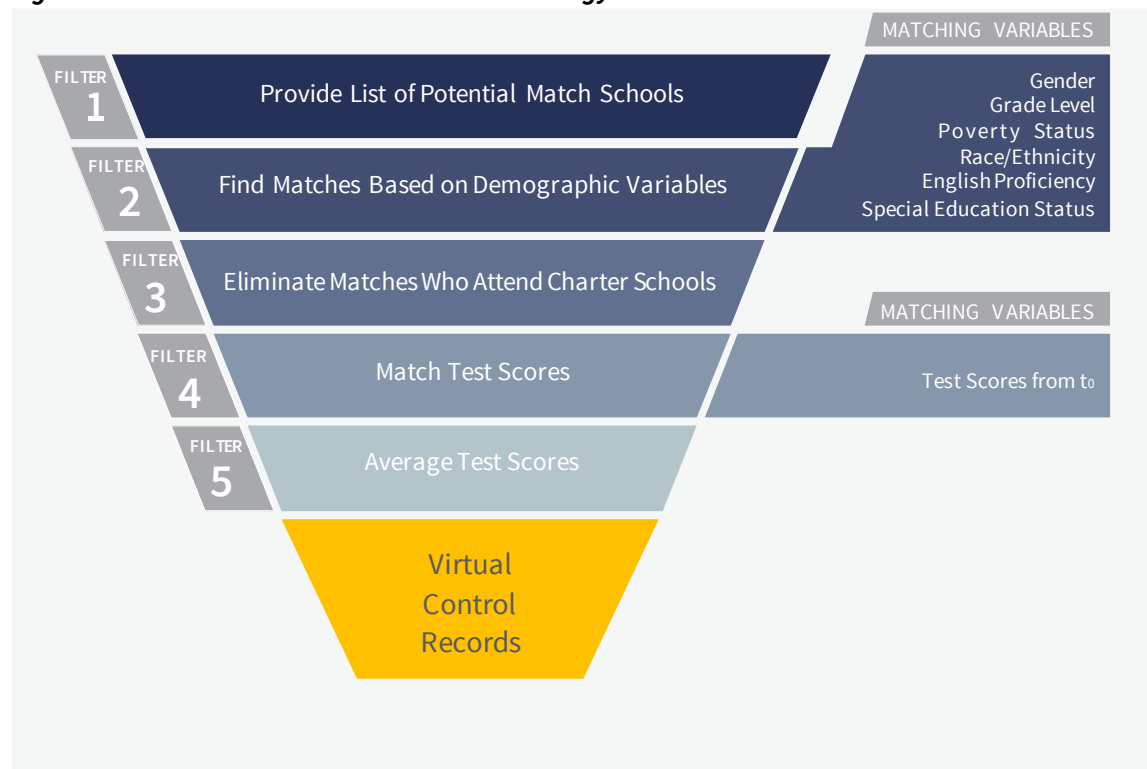
Our approach is displayed in Figure 1. We identify all the traditional public schools whose students transfer to a given charter school; each of these schools is designated as a “feeder school.” Using the records of the students in those schools in the year prior to the test year of interest (t_0), CREDO selects all of the available TPS students who match each charter school student.

Match factors include:

- Grade level
- Gender
- Race/ethnicity
- Poverty status
- English language learner status
- Special education status
- Prior test score on Ohio state achievement tests

² Devora H. Davis and Margaret E. Raymond, “Choices for Studying Choice: Assessing Charter School Effectiveness Using Two Quasi-Experimental Methods,” *Economics of Education Review* 31, no. 2 (April 2012): 225–236.

Figure 1: CREDO Virtual Control Record Methodology



At the point of selection as a VCR-eligible TPS student, all candidates and the individual charter school student have identical traits and matching baseline test scores. The focus then moves to the subsequent year, t_1 . The scores from this test year of interest (t_1) for as many as seven VCR-eligible TPS students are then averaged and a Virtual Control Record is produced. The VCR produces a score for the test year of interest that corresponds to the expected result a charter student would have realized had he or she attended one of the traditional public schools.

The above VCR method has been used in previous CREDO publications. We make two changes to the approach in this study. First, in our previous reports, if a charter student can be tracked for multiple periods in the study window, we matched the student for all the periods using the records in the year prior to the first growth period. In this study, we match the student period by period to conform to the new baseline equivalence criteria specified in *Procedures Handbook Version 4.0* of What Works Clearinghouse (WWC).³ Altering the match in this way means that caution is advised when comparing findings in this study and previous reports. Second, the United States Department of Agriculture phased in the Community Eligibility Provision (CEP) in Ohio and other states during the study period. The CEP allows schools and local education agencies with a minimum Identified Student Percentage (40 percent or higher) to provide free breakfast and lunch to all students. To minimize over-identification of students living in poverty in the analysis, we drop from the list of feeder schools a very small number of

³ What Works Clearinghouse, "Procedures Handbook Version 4.0," 2017, https://ies.ed.gov/ncee/wwc/Docs/referenceresources/wwc_procedures_handbook_v4.pdf.

TPS if their share of the students identified as economically disadvantaged by the state was 100 percent *and* represented a jump by 35 percentage points or more from the previous year. As shown in Appendix Table 2, restricting the feeder list did not affect the proportion of charter students for whom a VCR match was possible in this study of Ohio. It was possible to create virtual matches for 72 percent of observations of tested charter school students in reading and 70 percent in math.

Using statistical methods, we isolate the contributions of schools from other social or programmatic influences on a student's growth. Student growth data are analyzed in standard deviation units so that the results can be assessed for statistical differences. All the findings that follow are reported as the **average one-year growth** of charter school students relative to their VCR-based comparisons. With four years of student records in this study, it is possible to create three periods of academic growth.

To assist the reader in interpreting the meaning of growth, we include an estimate of the number of days of learning required to achieve growth of particular units of standard deviations. This estimate was calculated by Dr. Eric Hanushek and Dr. Margaret Raymond based on the 2017 National Assessment of Educational Progress (NAEP) test scores.⁴ Using a standard 180-day school year, each one standard deviation (s.d.) change in effect size is equivalent to 590 days of learning.

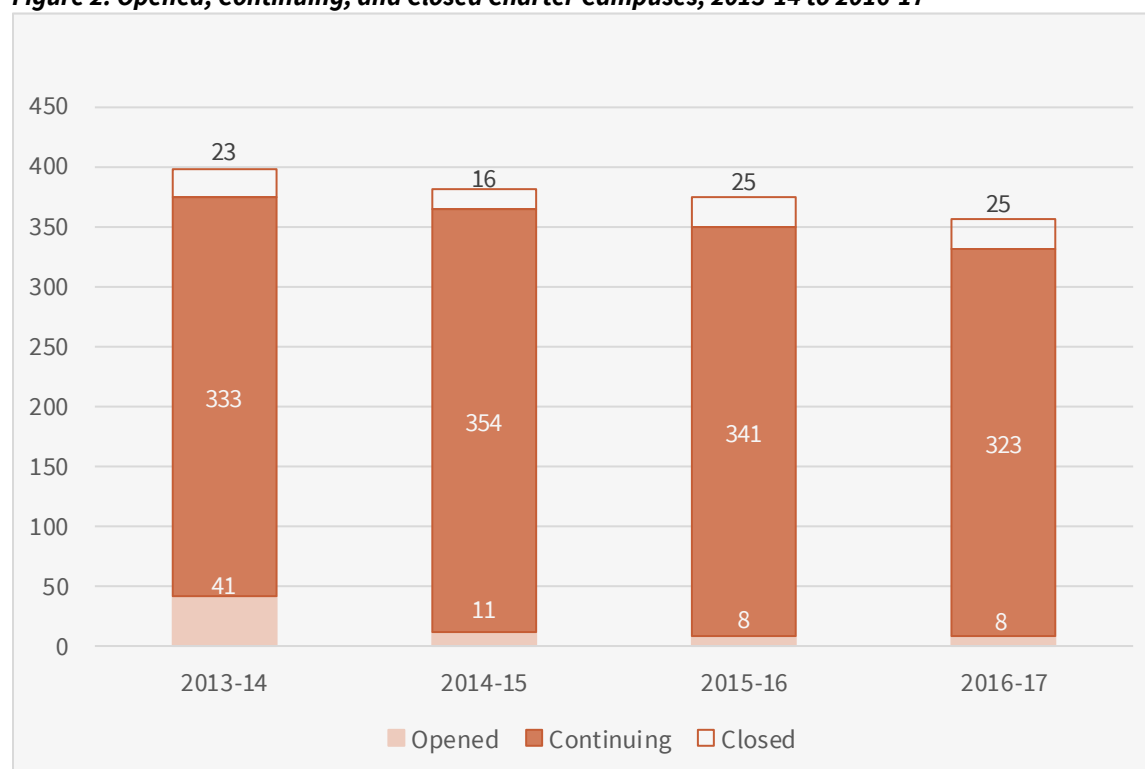
3. Ohio Charter School Demographics

Ohio witnessed some declines in the number of charter schools in operation across the study period. Figure 2 notes the newly opened, continuing, and closed charter school campuses from the 2013-14 school year to the 2016-17 year according to the National Center for Education Statistics (NCES).⁵ The figure portrays a downward trend in the number of charter schools open in Ohio over four years.

⁴ Detailed information about the 2017 NAEP test scores can be accessed via the “NAEP Reading Report Card” at https://www.nationsreportcard.gov/reading_2017/?grade=4 and the “NAEP Mathematics Report Card” at https://www.nationsreportcard.gov/math_2017/?grade=4.

⁵ The data were retrieved from “Public Elementary/Secondary School Universe Survey Data,” National Center for Education Statistics, <https://nces.ed.gov/ccd/pubschuniv.asp>. “Opened schools” indicates schools opened as new schools in the fall of the displayed year. “Continuing schools” indicates schools that were opened prior to the fall of the displayed year and remain open into the next school year (i.e., a school listed as continuing in the 2014-15 column opened some time prior to 2014-15 and did not close in 2014-15). “Closed schools” indicates schools that ceased operation by the spring of the displayed year (i.e., a school listed as closed in the 2014-15 column had its last year of operation in 2014-15 and closed at the end of that school year).

Figure 2: Opened, Continuing, and Closed Charter Campuses, 2013-14 to 2016-17



The charter campus decline is partly driven by the reduction in new openings. The number of charter schools that were newly opened shrank from 41 in the 2013-14 school year to 11 in 2014-15 and stood at eight in the following two years, representing a sharp reduction of 80 percent. Meanwhile, continuous closures from year to year are commensurate with the continued focus on closure of low-performing schools which is explicitly stated in HB 2.

The demographics of the charter schools may not mirror those of the TPS of Ohio as a whole. A number of factors account for this. Start-up charter schools are able to choose their location in eligible communities stipulated by the state law in Ohio. They may intentionally place schools in communities that have students with greater academic challenges—to go where the needs are greatest. Furthermore, charter schools may offer different academic programs and alternate school models which may disproportionately attract particular groups of students relative to TPS. In addition, parents and students choose to attend charter schools for a variety of reasons, such as location, school safety, small school size, academic focus, or special interest programs. The cumulative result of all these forces is that the student populations at charter schools and their TPS feeders may differ. Table 1 presents the characteristics of the student populations in all Ohio traditional public schools, in those TPS that comprise the set of charter feeder schools, and in the charter schools themselves in the 2015-2016 school year, the baseline year for the last growth period under study.

Table 1: Demographic Comparison of Students in TPS, Feeders, and Charters: 2015-16

	TPS	Feeders	Charters
Number of schools	3,243	1,663	373
Average enrollment per school	492	583	318
Total number of students enrolled	1,596,342	970,016	118,603
Students in Poverty	47%	53%	68%
English Language Learners	3%	4%	5%
Special Education Students	14%	15%	14%
White Students	74%	68%	40%
Black Students	14%	19%	46%
Hispanic Students	5%	6%	7%
Asian/Pacific Islander Students	2%	2%	1%
Native American Students	0%	0%	0%
Multi-Racial Students	5%	5%	6%

The data in Table 1 show that the demographic profile of charter schools is quite different from that of the public school population in Ohio as a whole, while the demographics for the feeder schools are more similar to the TPS population than to the charter population. The charter school population in Ohio differs from both the Ohio TPS and feeder populations in specific ways: charter schools have larger shares of black, Hispanic, and multi-racial students and smaller proportions of white and Asian/Pacific Islander students than TPS and feeder schools. The percentage of students in poverty enrolled in charter schools is also noticeably larger than in TPS and feeders.⁶

The proportion of students in charter schools receiving special education services is a continuing topic of focus and debate. As seen in Table 1, 14 percent of students in Ohio charter schools have a designated special education status, almost the same as the distributions in TPS and the feeder schools. This parity forms a contrast to apparently smaller national proportions of students with special education needs in charter schools than in TPS in our 2013 report on national charter schools as well as in our 2014 report for Ohio.^{7,8} The pattern and the change suggest improved equity in access to charter schools by special education students in Ohio. Besides, a larger share of Ohio's charter school population is designated as English language learners than the shares in the feeder schools and all of TPS.

In short, the student profile for the entire charter school community as displayed in Table 1 does not reveal any advantages in the stock of students attending the schools.

⁶ Students in poverty in this study are students identified as economically disadvantage in the state data.

⁷ Edward Cremata, Devora Davis, Kathleen Dickey, Kristina Lawyer, Yohannes Negassi, Margaret E. Raymond, and James Woodworth, *National Charter School Study 2013*, Center for Research on Education Outcomes, Stanford University, <https://credo.stanford.edu/documents/NCSS%202013%20Final%20Draft.pdf>.

⁸ *Charter School Performance in Ohio*, CREDO (Center for Research on Education Outcomes), Stanford University, December 18, 2014, https://credo.stanford.edu/pdfs/OHReport12182014_FINAL.pdf.

Online charter schools have received increasing attention in the educational landscape nationally and in Ohio. With no physical or geographic barriers to enrollment, online charter schools can draw students from across the state and use online instruction as the method of curriculum delivery. People often use the terms “online schools,” “cyber schools,” and “virtual schools” interchangeably. In this study, we use the designation of virtual schools by the National Center for Education Statistics (NCES). According to the definition of NCES (2016, p. 9), a school is a virtual school if it is “a public school that only offers instruction in which students and teachers are separated by time or location, and interaction occurs via computers or telecommunications technologies. A virtual school generally does not have a physical facility that allows students to attend classes on site.”⁹

As shown in a one-year snapshot in Table 2, online charter schools educate more than 30 percent of all Ohio charter students and serve different student populations than brick-and-mortar charters. Specifically, online charter schools have larger percentages of white students, smaller proportions of black and Hispanic students, fewer students living in poverty, and slightly more students with special education needs. The number of English language learners is almost zero in Ohio online charters. Overall, within-sector comparisons in Table 2 indicate that brick-and-mortar charter schools serve larger shares of students who are disadvantaged on various dimensions than online charters.

Table 2: Demographic Composition of Overall, Brick-and-Mortar, and Online Charter Schools: 2015-16

	All Charters	Brick-and-Mortar Charters	Online Charters
Number of schools	373	349	24
Average enrollment per school	318	235	1,519
Total number of students enrolled	118,603	82,152	36,451
Students in Poverty	68%	75%	53%
English Language Learners	5%	7%	0%
Special Education Students	14%	14%	15%
White Students	40%	25%	75%
Black Students	46%	60%	13%
Hispanic Students	7%	8%	4%
Asian/Pacific Islander Students	1%	1%	1%
Native American Students	0%	0%	0%
Multi-Racial Students	6%	6%	7%

⁹ National Center for Education Statistics, “Documentation to the 2014-15 Common Core of Data (CCD) Universe Files,” 2016, retrieved from “Public Elementary/Secondary School Universe Survey Data,” <https://nces.ed.gov/ccd/pubschuniv.asp>.

4. Analytic Findings of Charter School Impacts

Overall Charter School Impact on Student Progress

A foundational question of this study is whether charter schools differ overall from traditional public schools in how much their students learn. To answer this question, we estimate the one-year academic gains observed for all matched charter school students in all growth periods and compare their average learning gain with that of the VCR students.

Please refer to the sidebar titled Graphics Roadmap 1 where guidance is provided to help readers understand the charts that follow.

As described in the Study Approach section, student growth data are analyzed in units of standard deviations so that the results can be assessed for statistical differences. To help the reader interpret our analysis results, we transform standard deviation units of growth into days of learning based on a standard 180-day school year (Table 3).¹⁰ Interested readers can refer to the Study Approach section and Appendix B for detailed explanations of the computation of days of learning.

Graphics Roadmap 1

The graphics in this section have a common format.

Each graph presents the average performance of charter students relative to their **pertinent comparison students**. The reference group differs depending on the specific comparison being made. Where a graph compares student subgroup performance, the pertinent comparison students are the same for both subgroups. Each graph is labeled with the pertinent comparison group for clarity.

We show two axes on the graphs to help the reader get a sense of learning gains. The **left axis** indicates standard deviation units of learning gains of charter students relative to their comparison students. The **right axis** displays the same learning gains in days of learning. The statistical tests are performed on the values as they are enumerated on the left axis.

The **height** of the bars in each graph reflects the difference in the performance between charter school students and the comparison student group.

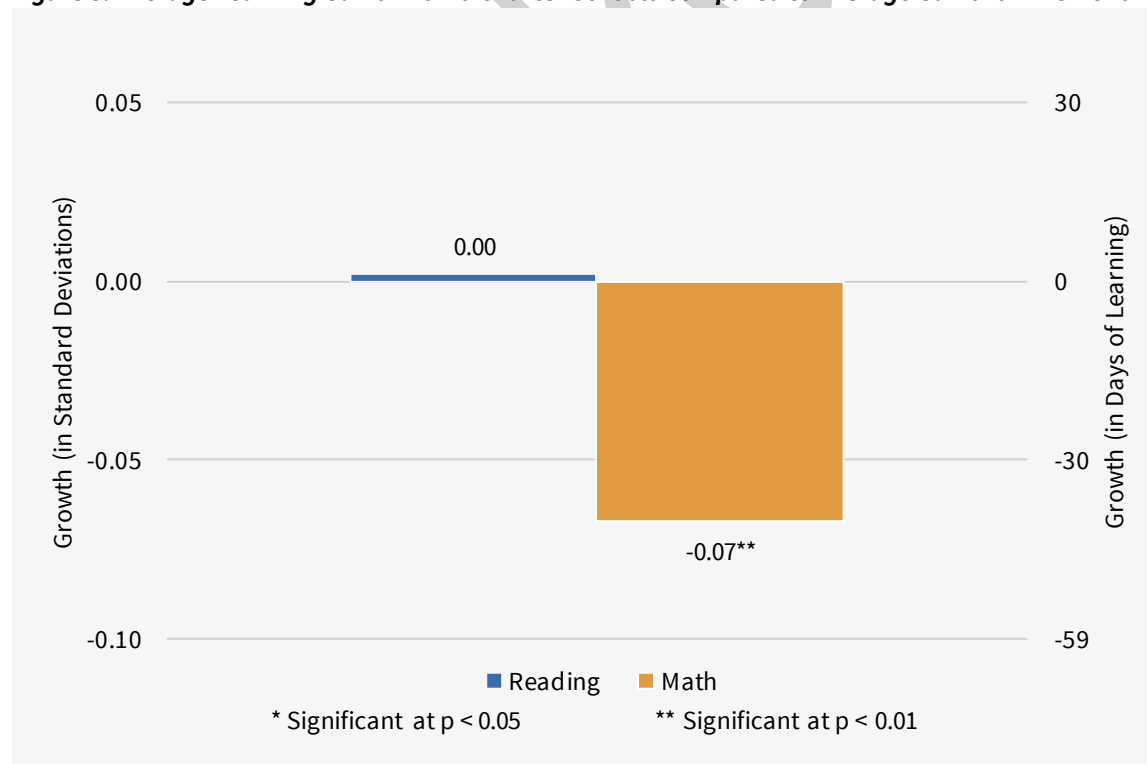
Asterisks are used to reflect the level of statistical significance of the difference between the group represented in the bar and its comparison group of similar students in TPS. The absence of asterisks means that the schooling effect is not statistically different from zero.

¹⁰ The values in Table 3 are updated from past reports using the latest (2017) NAEP scores, which show slower absolute annual academic progress than earlier administrations. See Eric A. Hanushek, Paul E. Peterson, and Ludger Woessmann, “Achievement Growth: International and U.S. State Trends in Student Performance,” *Education Next* 12 (July 2012): 1–35.

Table 3: Transformation of Average Learning Gains to Days of Learning

Standard Deviations	Days of Learning
0.05	30
0.10	59
0.15	89
0.20	118
0.25	148
0.30	177
0.35	207
0.40	236

Figure 3 displays the overall charter school impact on student academic progress in Ohio. The reference group, represented by the 0.00 baseline in the graph, is the average TPS VCRs in the state. Using the results from Figure 3 and the transformations from Table 3, we can see that in a typical school year, charter students in Ohio lag behind their TPS peers in math. This disadvantage for charter students is equivalent to 41 fewer days of learning in a 180-day school year. Because the difference in the growth in reading is not statistically significant, Ohio charter students experience similar growth in the 180-day period as they would have in a traditional school setting.

Figure 3: Average Learning Gains in Ohio Charter Schools Compared to Average Gains for TPS VCRs

Charter School Impact for the 2014-2017 Cohort

This section compares the performances of Ohio charter schools across three of CREDO's studies: CREDO's 2009 study on national charter school performance,¹¹ CREDO's 2014 study on Ohio charter school performance,¹² and this current 2019 study on Ohio charter schools. Figure 4 depicts the academic growth of Ohio's charter sector in the three reports. As pointed out in the previous section, transformation of growth units of standard deviations into days of learning in this study is updated from past reports, using the most recent NAEP scores. Therefore, only growth in standard deviations is shown in Figure 4. In addition, as explained in the Study Approach chapter, we tweak our VCR method a little in this study by matching a charter student by period so as to meet the WWC Version 4.0 requirement for baseline equivalence. Therefore, the comparison of the overall charter effect across three reports is only suggestive.

Figure 4: Average Learning Gains in Ohio Charter Schools Compared to Average Gains for TPS VCRs from the 2009 National Charter Study, 2014 Ohio Study, and 2019 Ohio Study

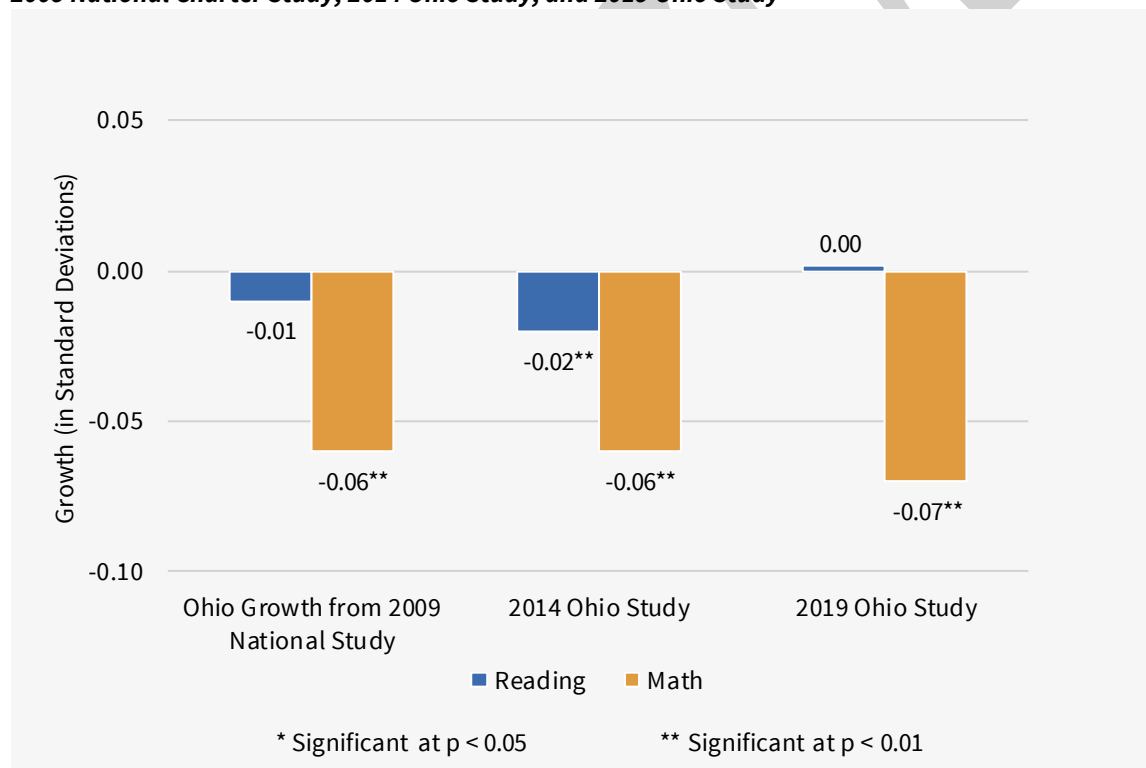


Figure 4 indicates minor changes in the academic progress of Ohio charter school students across three studies. In reading, charter students register similar learning gains in the 2009 study, fall behind TPS peers slightly in the 2014 report, and catch up in this study. The shift in reading gains erases any

¹¹ Cremata et al., *National Charter School Study 2013*.

¹² CREDO, *Charter School Performance in Ohio*.

difference between charter school students and their TPS VCR twins. In math, charter students made less progress than their TPS virtual twins in all three studies. The gap is slightly larger in the current study than in the previous two reports. Overall, this graph shows no dramatic academic improvement on the part of Ohio's charter sector across three studies.

Charter School Impact by Growth Period

To determine whether performance is consistent over the window of this study, the impact of attending a charter school on academic progress is examined separately for each of the three growth periods. Recall that a growth period is the measure of progress from one school year to the next. In the presentation of results in Figure 5, the denotation "2014-2015" covers academic growth that occurred between the end of the 2013-2014 school year and the end of the 2014-2015 school year. Similarly, the denotation "2016-2017" corresponds to the year of growth between the 2015-2016 and the 2016-2017 school years.

Figure 5: Learning Gains in Ohio Charter Schools Compared to Gains for TPS VCRs by Growth Period: 2014-2015 to 2016-2017

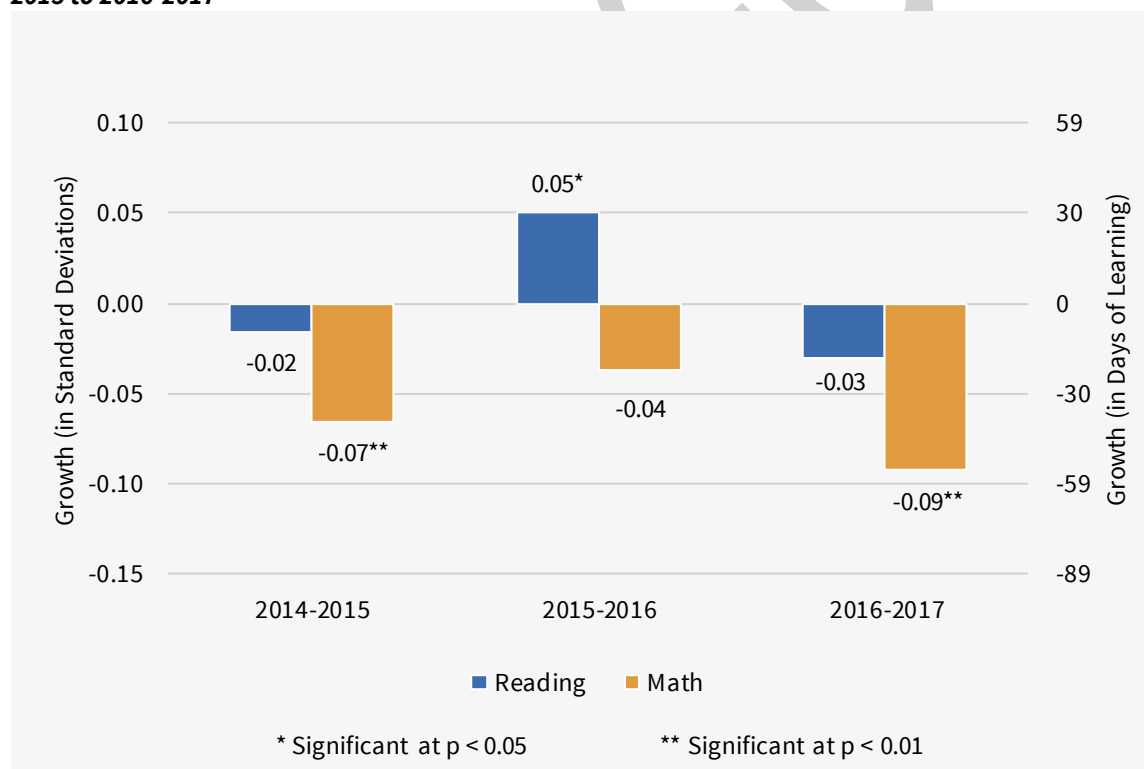


Figure 5 reveals fluctuation in the impact of charter school enrollment across the study window. In the 2014-2015 and 2016-2017 growth periods, charter students performed similarly in reading while suffering losses in math relative to their TPS VCRs. Charter students' disadvantage in math relative to their TPS peers translated to 41 fewer days of learning in the 2014-2015 growth period and 53 fewer days of learning in the 2016-2017 period. The growth period 2015-2016 witnessed a more positive

scenario for charter students: they exceeded the growth of their TPS peers in reading by 30 days of learning and were on a par with TPS VCRs in math.

As mentioned in the Introduction section, Ohio's state assessments of reading and math changed multiple times during the span of the study, shifting to PARCC in the school year 2014-2015 and then to Ohio's State Tests provided by AIR in spring 2016. At the same time, online testing was implemented, but students were not equally versed in the use of new testing technologies. The question of whether and how the fluctuation in students' performance was associated with the testing changes and other factors warrants a comprehensive investigation in a separate study.

5. Charter School Analysis by School Attribute

Charter School Impact by School Locale

Depending on their locales, charter schools serve different student populations, face different levels of available human capital, or both. Though charter schools in urban areas receive the bulk of media attention, charter schools in other locales may produce different results. The results in Figure 6 represent the disaggregated impacts of charter school enrollment for urban, suburban, town, and rural charter schools. In this breakdown, charter students in different locations are compared with their virtual twins in TPS.¹³ For the following analysis, the comparison is relative to whatever actual progress each group of VCRs realized. But the reader should not assume that the transformation of each VCR group to 0.00 means that all the VCRs have equivalent academic growth.

¹³ The National Center for Education Statistics defines 12 urban-centric locales which are divided into four main locale types: city, suburb, rural, and town.

Figure 6: Learning Gains in Ohio Charter Schools Compared to Gains for TPS VCRs by School Locale

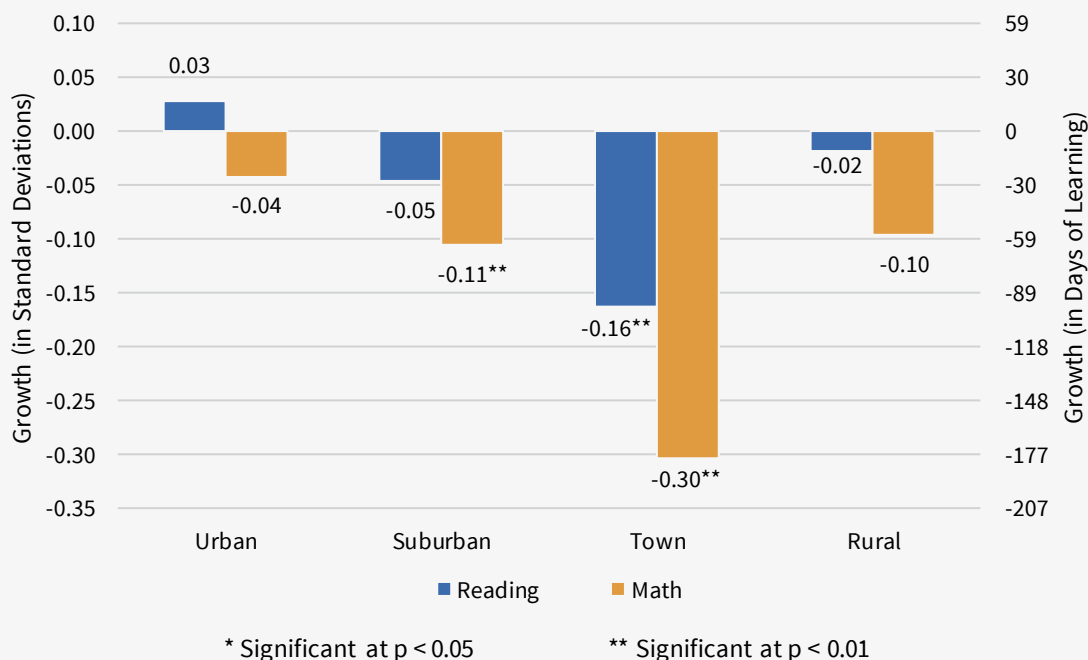


Figure 6 illustrates differences in the academic growth of charter students across locales. Charter students in urban and rural Ohio and their TPS peers perform similarly in both reading and math. The greatest disparities surface for town charter students, who lag behind their TPS VCRs by 94 days of learning in reading and 177 days of learning in math. Suburban charter students do not differ significantly from TPS students in reading but have a 65-day learning deficit in math compared to TPS peers. Comparing the findings in this graph with the overall pattern in Figure 3, we can see that urban charters erase the significant differences in other locales, even if the nominal degree of their gains is smaller than in other locales.

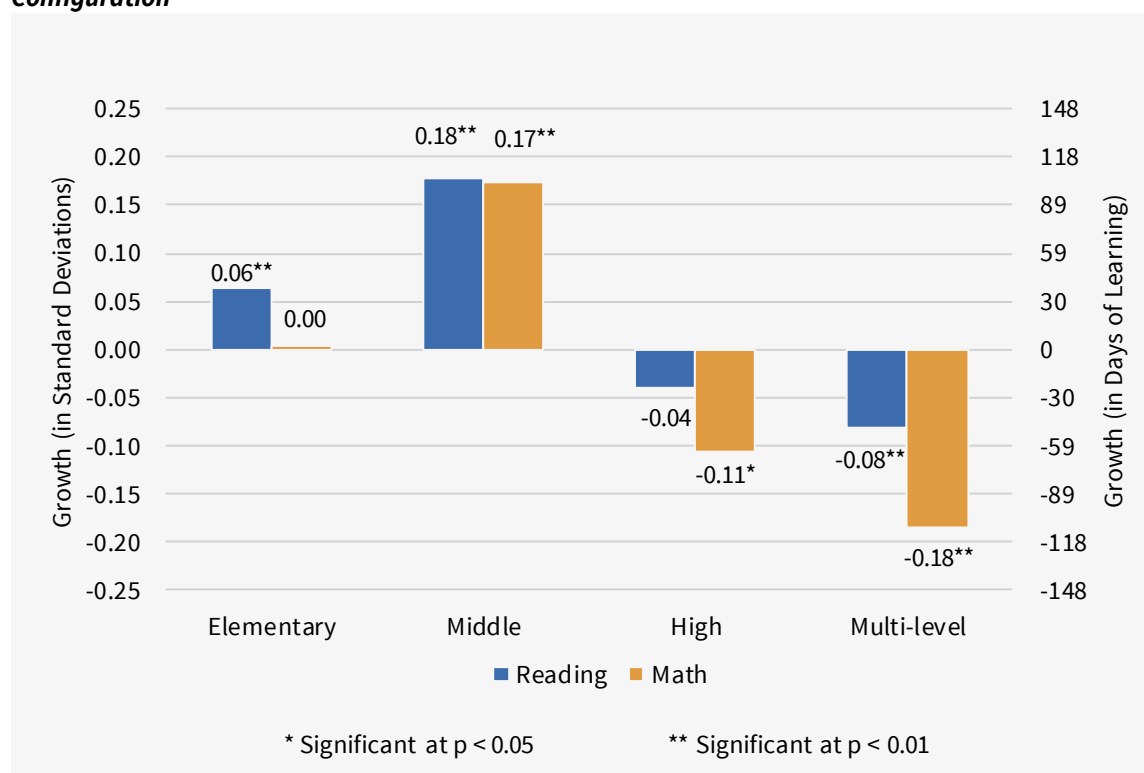
Charter School Impact by School Grade Configuration

All charter schools choose which grade levels to offer. Some charter operators focus on particular grades, some seek to serve a full range of grades, and others develop by adding one additional grade each year. The National Center for Education Statistics assigns schools the label of “elementary school,” “middle school,” “high school,” or “multi-level school” based on their predominant grade pattern. The designation of “multi-level school” can apply to a school that serves elementary and middle grades, middle and high grades, or all K-12 grades.¹⁴ Looking at performance by school grade configuration helps inform us whether specialization in a specific range of grades produces better

¹⁴ The National Center for Education Statistics (NCES) designates a school as an elementary, middle, high, or multi-level school. CREDO uses the designation by NCES. The sole exception is that CREDO considers a school to be a high school if the lowest grade served is ninth grade or above.

results. The outcomes of students by the grade configuration of the charter school they attend are reported in Figure 7. Again, the comparison is relative to whatever actual progress each group of VCRs realized. The reader should not assume that the transformation of each VCR group to 0.00 means that all the VCRs have equivalent academic growth.

Figure 7: Learning Gains in Ohio Charter Schools Compared to Gains for TPS VCRs by School Grade Configuration



The results in Figure 7 show that, on average, charter middle school students achieve the strongest learning gains in both reading and math. Compared to their TPS virtual twins, charter middle school students gain learning surpluses equivalent to 106 additional days of learning in reading and 100 extra days of learning in math. Students attending elementary charters also demonstrate stronger growth equivalent to 35 more days of learning than their TPS VCRs in reading while students in charter and TPS elementary schools grow similarly in math.

Opposite patterns are found among charter students enrolled in high and multi-level schools. Students in multi-level charter schools experience the weakest growth compared to their TPS virtual twins, especially in math, where they have an equivalent of 106 fewer days of learning than TPS VCRs. They also lag behind their TPS peers by 47 days of learning in reading. Students enrolled in charter high schools do not differ significantly in reading growth from their TPS peers but underperform significantly in math by 65 days of learning.

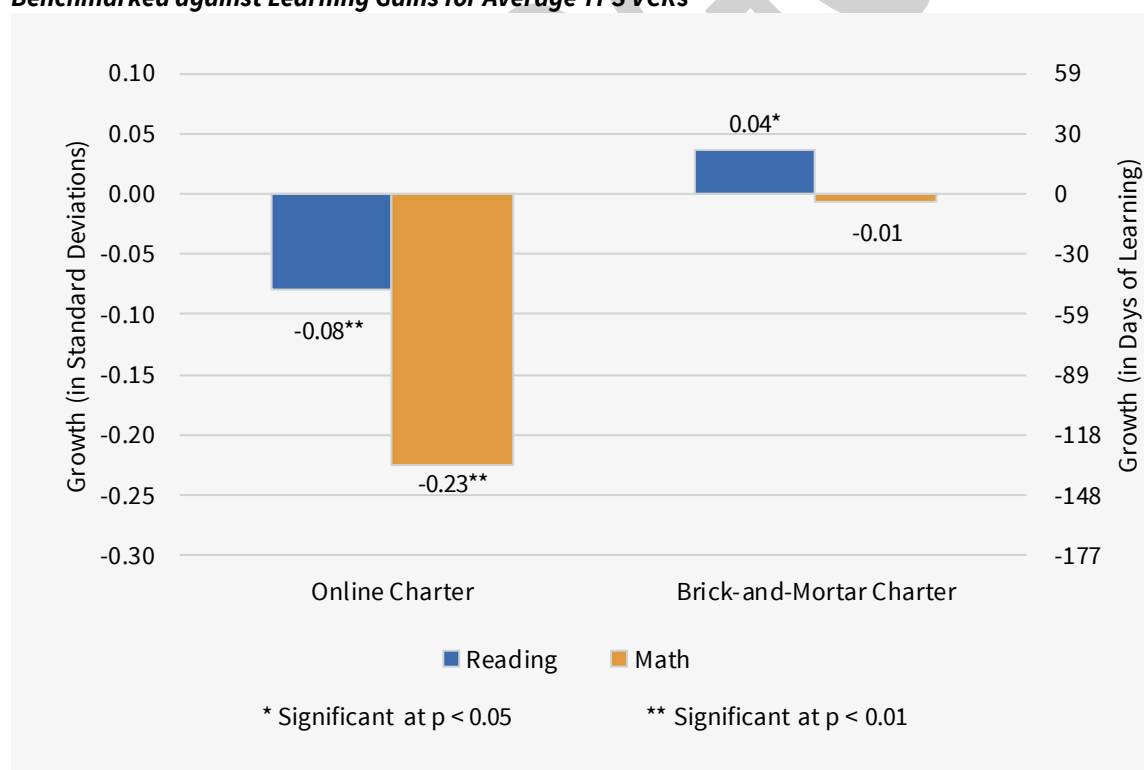
Charter School Impact by Delivery System

There are both brick-and-mortar and online charters in Ohio. Students from all over the state can attend online charter schools and receive instruction online. As Table 2 revealed, online charter schools enroll over 30 percent of charter students in Ohio and have different student compositions compared to brick-and-mortar charters. CREDO's earlier study on online charter schools also found that online charter schools serve students with higher mobility rates and have significantly negative impacts on student academic progress.¹⁵

In this sector, we break down the charter school impact on student performance by delivery system and display two distinct comparisons in two graphs:

1. Figure 8 compares the performance of students in online charter schools and students in brick-and-mortar charters to the performance of the average TPS VCR.
2. Figure 8a compares the difference in learning of students enrolled in online charter schools and those who attend brick-and-mortar charters.

Figure 8: Student Learning Gains for Students in Ohio Online and Brick-and-Mortar Charter Schools Benchmarked against Learning Gains for Average TPS VCRs

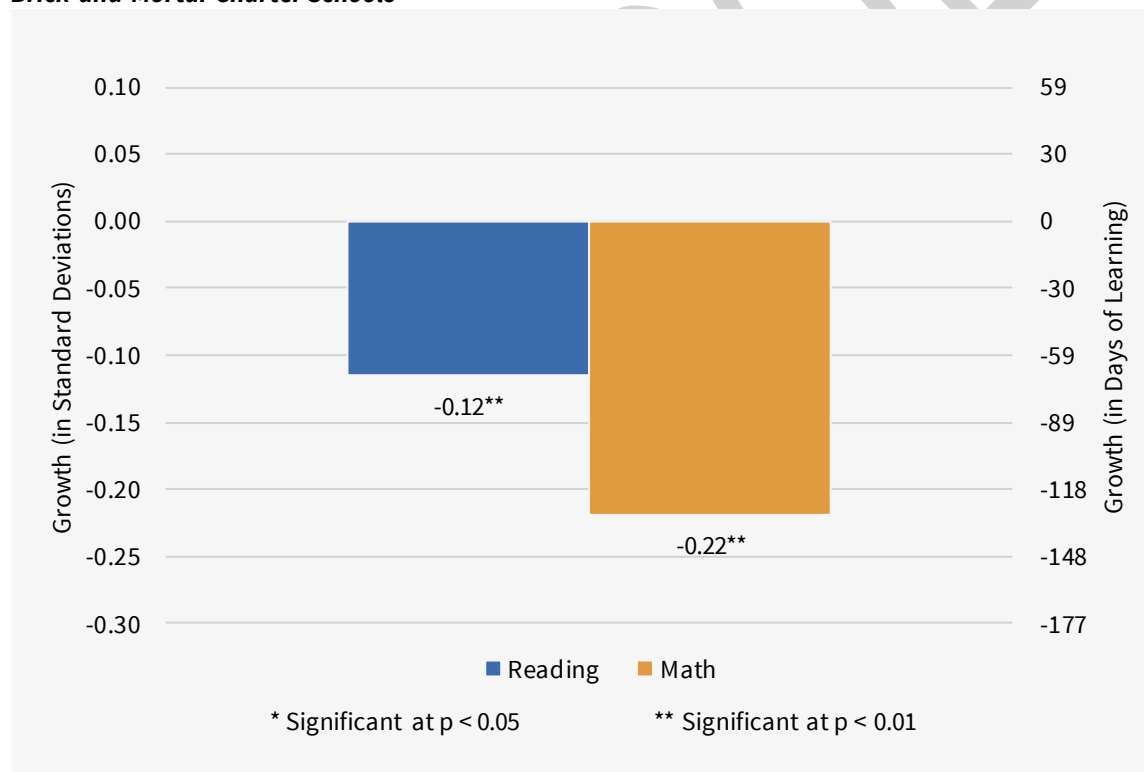


¹⁵ James L. Woodworth, Margaret E. Raymond, Kurt Chirbas, Maribel Gonzalez, Yohannes Negassi, Will Snow, and Christine Van Donge, *Online Charter School Study 2015*, CREDO (Center for Research on Education Outcomes), Stanford University, <https://credo.stanford.edu/pdfs/Online%20Charter%20Study%20Final.pdf>.

According to Figure 8, students attending online charter schools have substantially weaker growth in both reading and math than the average TPS VCRs. The gaps translate to 47 fewer days of learning in reading and 136 fewer days of learning in math for online charter students. In contrast, students in brick-and mortar charters exhibit stronger growth in reading (equivalent to 24 days of extra learning) and obtain similar learning gains in math as compared with the average TPS students.

Figure 8a benchmarks the performance of students in online charter schools against that of students attending brick-and-mortar charters (whose performance is represented by the 0.00 line). Online charter school students gain significantly less in both subjects. To be specific, they are behind brick-and-mortar charter students by 71 days of learning in reading. The cleavage in math is greater, with online charter students losing an equivalent of 130 days of learning as compared to students in brick-and-mortar charters.

Figure 8a: Student Learning Gains in Ohio Online Charter Schools Benchmarked against Students in Ohio Brick-and-Mortar Charter Schools



Figures 8 and 8a above demonstrate two important points. First, Ohio online charter students fall behind in both reading and math compared to the average VCR in TPS or brick-and-mortar charter school students. Second, the negative performance of online charter students is sufficiently large as to wipe out the positive growth of brick-and-mortar charter students in reading, which leads to the lack of overall Ohio charter school effects on reading growth in Figure 3. Similarly, the negative overall

charter impact on math progress in Ohio displayed in Figure 3 is driven entirely by the strikingly negative math growth of students in online charter schools.

6. Charter School Analysis by Student Characteristic

Charter School Impact by Race/Ethnicity

One of the enduring advances of the *No Child Left Behind Act* of 2001 and the subsequent *Every Student Succeeds Act* of 2015 is the recognition that average results may not be evenly distributed across all students. Attention to the differences in the performance of students of various racial/ethnic backgrounds and other attributes has become standard practice in most assessments of school performance. As shown in Table 1, Ohio charter schools serve a diverse student population. Their ability to support the progress of disadvantaged students is an important policy goal in the state and a strong focus of this study. The effectiveness of charter schools across ethnic and racial groups is especially important given the significant shares of historically underserved students that charter schools enroll.

The impacts of charter schools on the academic gains of black and Hispanic students are reported in Figures 9 through 10a. For each student subgroup, we present two related graphs. Graphics Roadmap 2 in the sidebar provides guidance on how to interpret the graphs and their relation to each other. In short, the first graph depicts the growth of TPS students and charter students in the particular subgroup of interest as compared to the growth of the "average white TPS student." Graphs labeled "a" show whether the learning gains in the charter school student subgroup differ significantly from their VCRs in the same subgroup.

Graphics Roadmap 2

Figures 9 through 10a show two important contrasts for black and Hispanic student groups. For each student subgroup, we present two related graphs:

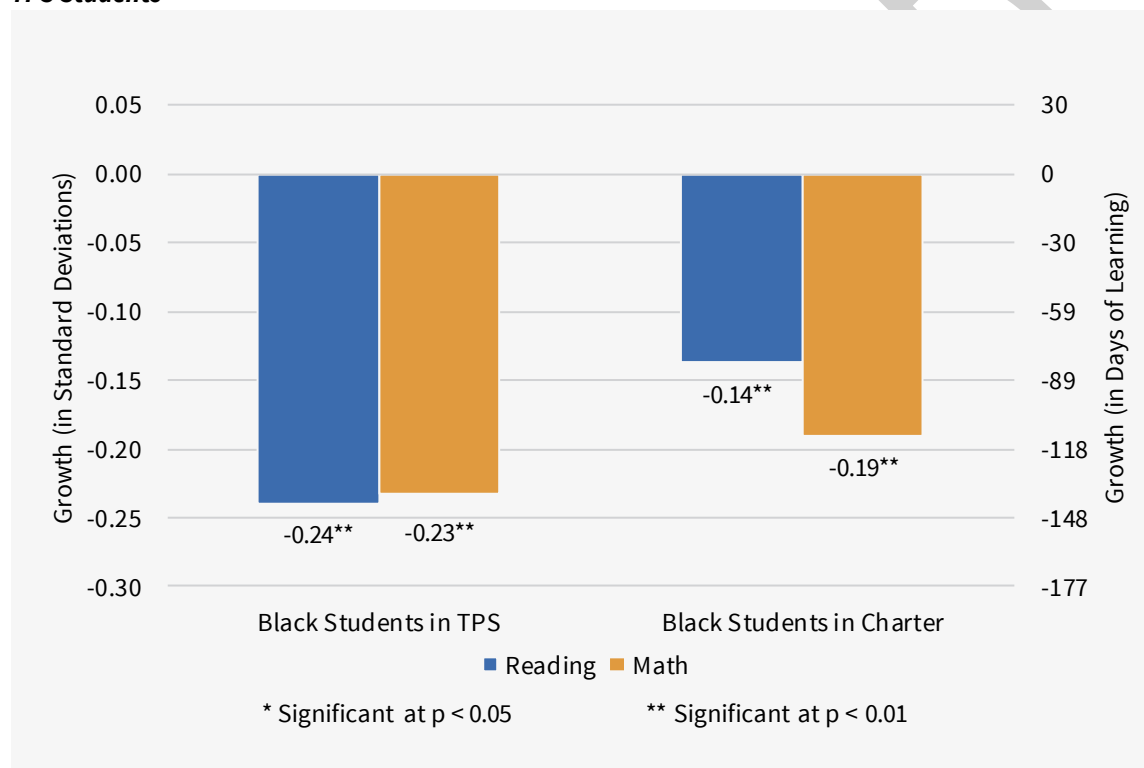
The **first graph** displays the growth of **TPS students and charter students in the particular subgroup** of interest compared to the growth of the "**average white TPS student**." In this comparison, the white TPS student is male, does not live in poverty, does not qualify for special education services or English Language Learner support, and is not repeating his current grade. The graph sets the performance of the average white TPS student to **zero** and shows how learning of students in the subgroup compares.

The **asterisks** indicate the level of statistical significance. Thus, if there are no asterisks, we interpret the difference in learning gains as similar to the white TPS comparison student. The size and direction of the **bars** in the graph show the direction and magnitude of learning differences. If there is no difference in the learning gains, the bar would be missing entirely. If the learning of the student group in question is not as great as the comparison baseline, the bar is negative. If the learning gains exceed the comparison, the bar is positive.

Graphs labeled "a" display the results of a second comparison testing whether the learning gains in the **charter school student subgroup** differ significantly from **their VCRs in the same student subgroup**. In these graphs, the performance of the TPS peers in the subgroup are set to **zero** and the learning gains of the charter school students in the subgroup are measured against that baseline. As with the first graph, asterisks denote statistical significance.

Black students account for 46 percent of the charter school population in Ohio. As shown in Figure 9, black students in TPS and in charter schools in Ohio each make significantly smaller annual academic progress in reading and math when compared to the average white VCR student. To be specific, black TPS students have 142 fewer days of learning in reading and 136 fewer days of learning in math than white TPS students. Black charter school students also display weaker growth than white TPS students, equivalent to 83 fewer days of learning in reading and 112 fewer days of learning in math.

Figure 9: Learning Gains of Black Students in TPS and Charters Benchmarked against Learning Gains of White TPS Students



When the learning of black students enrolled in charter schools is compared to that of black students enrolled in TPS, the results reveal that Ohio black charter students experience greater yearly progress compared to their TPS peers in both subjects (Figure 9a). The surpluses translate to 59 additional days of learning in reading and 24 more days in math. It is notable that the 2014 CREDO study on Ohio charter school performance found similar growth for black students in TPS and charter schools. Thus, the results for black students in charter schools in this analysis suggest improvement over time.

Figure 9a: Relative Learning Gains for Black Charter School Students Benchmarked against Their Black TPS Peers

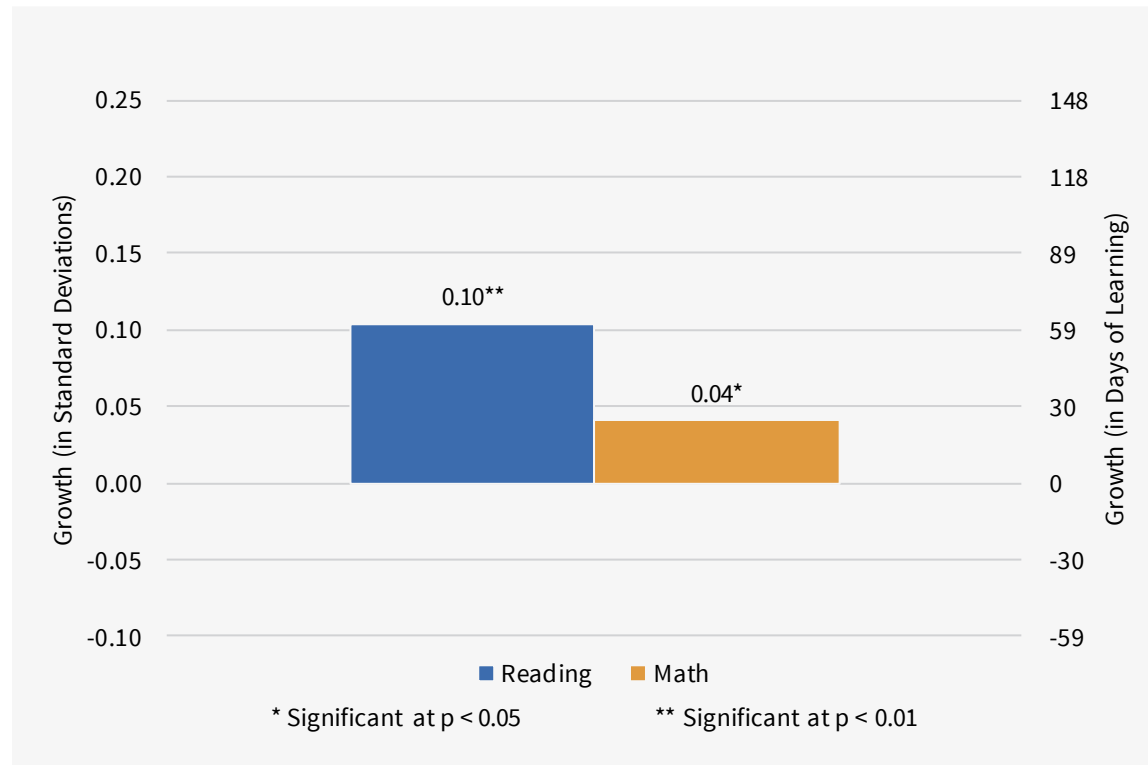


Figure 10 compares the performance of TPS and charter Hispanic students relative to the average white TPS student. Hispanic students in both TPS and charter settings show significantly weaker annual academic growth in reading and math compared to the average white TPS VCR. Hispanic students in TPS lag behind the average white TPS student by 71 days of learning in both reading and math in a year. Hispanic students in charter schools gain less than the average white TPS VCR by 59 days of learning in reading and 94 days of learning in math.

Figure 10: Learning Gains of Hispanic Students in TPS and Charters Benchmarked against Learning Gains of White TPS Students

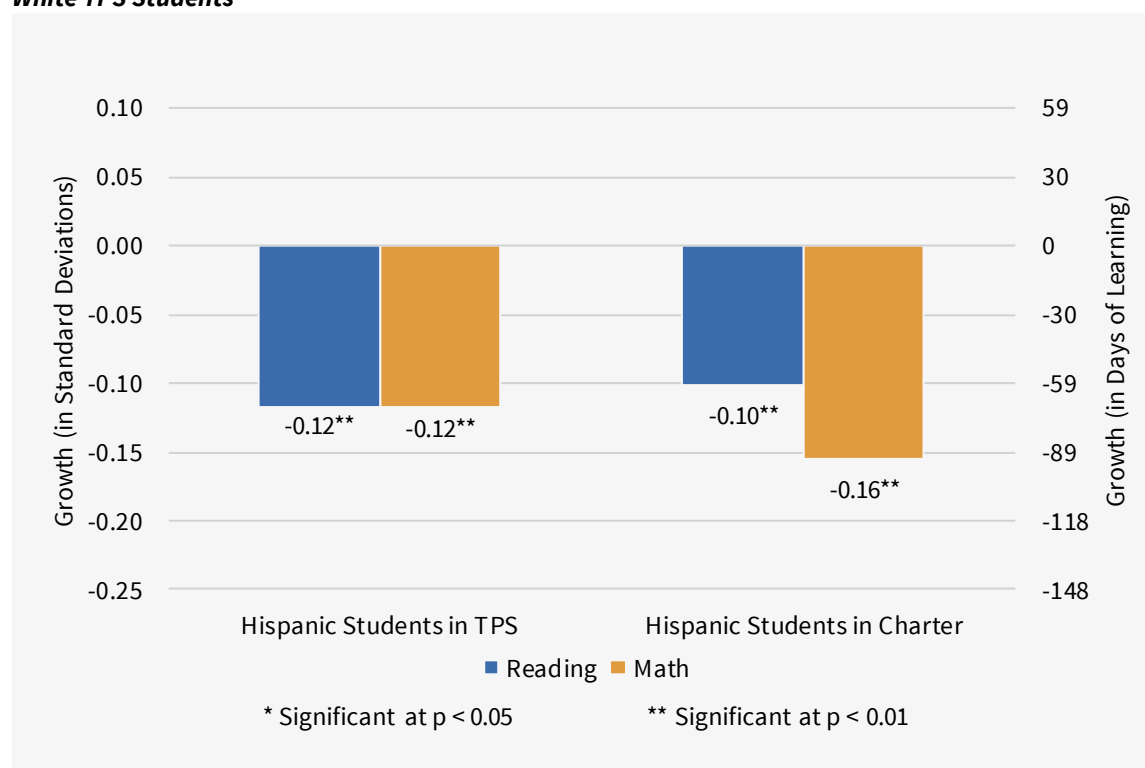
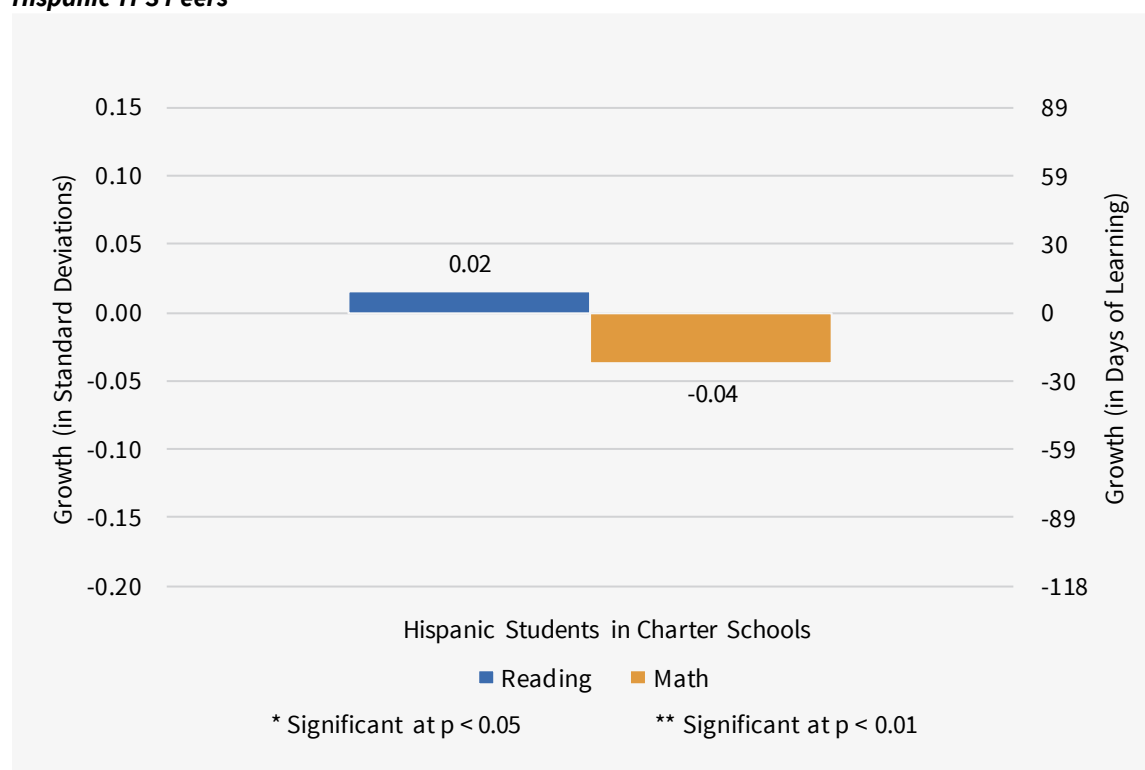


Figure 10a displays the differences in learning gains between Hispanic students enrolled in charter schools and Hispanic peers in TPS. In both subjects, the annual learning gains of Hispanic students in charter schools are not significantly different from those of their Hispanic peers in TPS. That being said, in our 2014 Ohio state study, Hispanic students in charter schools fell behind Hispanic peers in TPS in both reading and math. The parity shown in Figure 10a implies that Hispanic charter students have caught up with their TPS peers since the period covered in the previous study.

Figure 10a: Relative Learning Gains for Hispanic Charter School Students Benchmarked against Their Hispanic TPS Peers



To summarize the race/ethnicity analyses, black students in both charter schools and TPS make smaller annual academic progress than an average white TPS student in reading and math. Hispanic TPS and charter students post smaller gains as well, but the learning gaps are smaller than seen for black students in the same sector. When the focus shifts to comparing the outcomes of student subgroups to each other by sector, black charter students surpass black TPS VCRs in both reading and math and Hispanic charter students are on a par with Hispanic TPS peers in both subjects. Thus, the results indicate that charter school enrollment yields significant academic advantage for black students and does not diminish learning for Hispanic students.

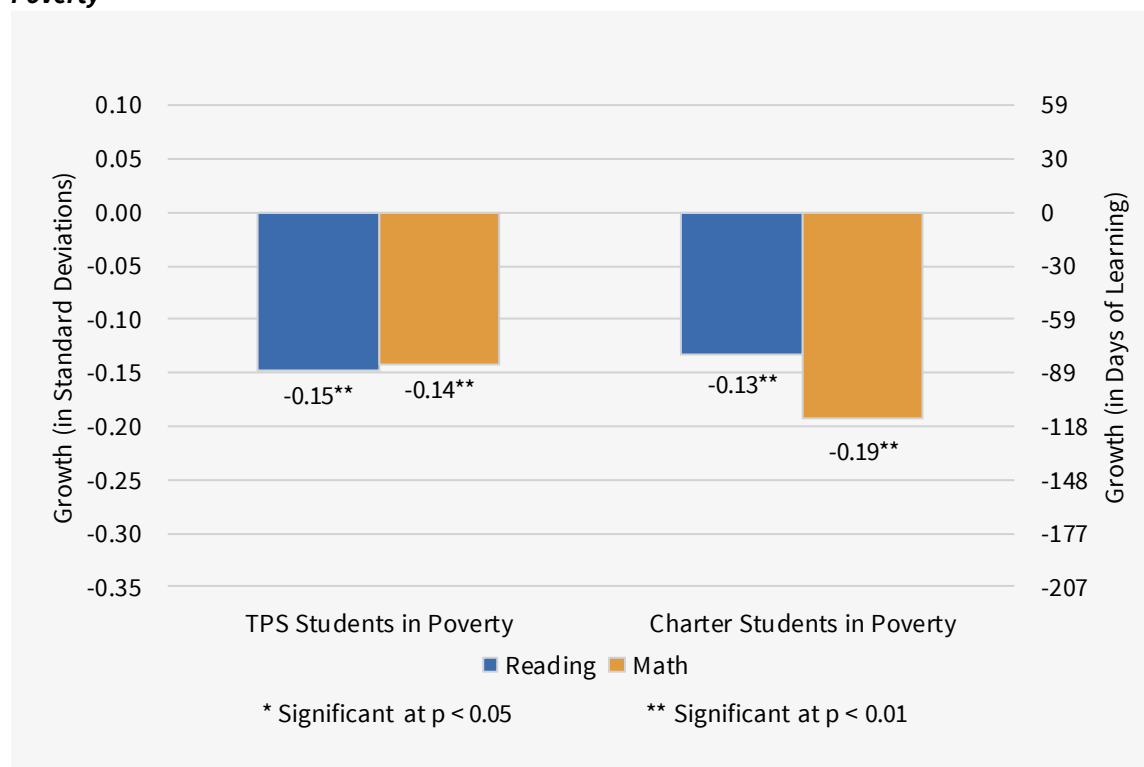
Charter School Impact with Students in Poverty

Many charter school operators expressly aim to improve educational outcomes for traditionally underserved students, especially for students in poverty. In Ohio, 68 percent of charter school students live in poverty, compared to 47 percent of TPS students (Table 1).

Figure 11 presents the annual academic growth for students in poverty. It is important to note that in this graph, the baseline differs from the race/ethnicity graphs presented earlier: it is a TPS student who does not live in poverty. The study isolates the relationship between poverty and growth. This leaves a picture of the difference in the impact of charter attendance on students in poverty compared to similar students in TPS who are not in poverty. The bars on the right side of Figure 11 (-.13** for reading and -

.19** for math) represent the impact of being a student in poverty and attending a charter school.¹⁶ The bars on the left side of Figure 11 picture a TPS student in poverty. Both are compared to TPS students who are not in poverty, represented by the .00 line.

Figure 11: Overall Learning Gains for TPS and Charter Students in Poverty Compared to TPS Students Not in Poverty

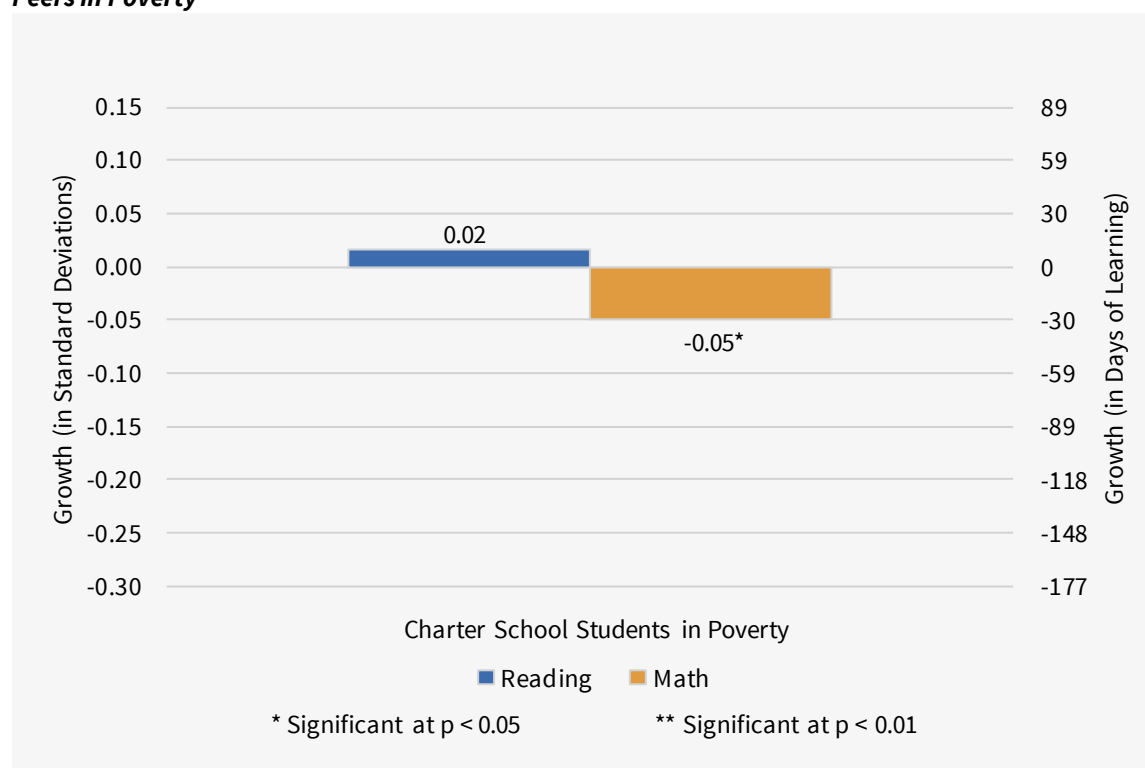


The results in Figure 11 suggest that students in poverty, regardless of whether they attend TPS or charter schools, significantly underperform TPS students not in poverty in both reading and math. TPS students in poverty make less academic progress than non-poverty TPS students by 89 days of learning in reading and 83 days of learning in math. Charter school students in poverty achieve less academic growth in reading compared to their non-poverty TPS students too, with the deficit amounting to 77 days of learning in reading and 112 days of learning in math. These results mean that learning gaps for charter and TPS students based on the socioeconomic status have persisted.

Figure 11a compares the growth of charter students in poverty versus their TPS peers. Charter school students in poverty make less progress than TPS peers in poverty in math by 30 days of learning, while the two subgroups perform similarly in reading.

¹⁶ The effect for a charter student in poverty includes both the charter effect and a poverty effect.

Figure 11a: Relative Learning Gains for Charter School Students in Poverty Benchmarked against Their TPS Peers in Poverty



Charter School Impact with Combined Race/Ethnicity and Poverty

In public education, some of the most academically challenged students are those who are both living in poverty and are members of historically underserved racial or ethnic minorities. These students represent a large subgroup. Within the national charter school community, these groups receive special attention. To examine the extent to which gaps are being addressed in Ohio, we further disaggregate the charter school impact on black and Hispanic students in poverty.

The impact of Ohio charter schools on the academic gains of black students living in poverty is presented in Figures 12 and 12a. Similarly, Figures 13 and 13a report the impact of charter schools on Hispanic students in poverty.

Figure 12: Learning Gains of Black TPS and Charter Students in Poverty Compared to Learning Gains of White TPS Students Not in Poverty

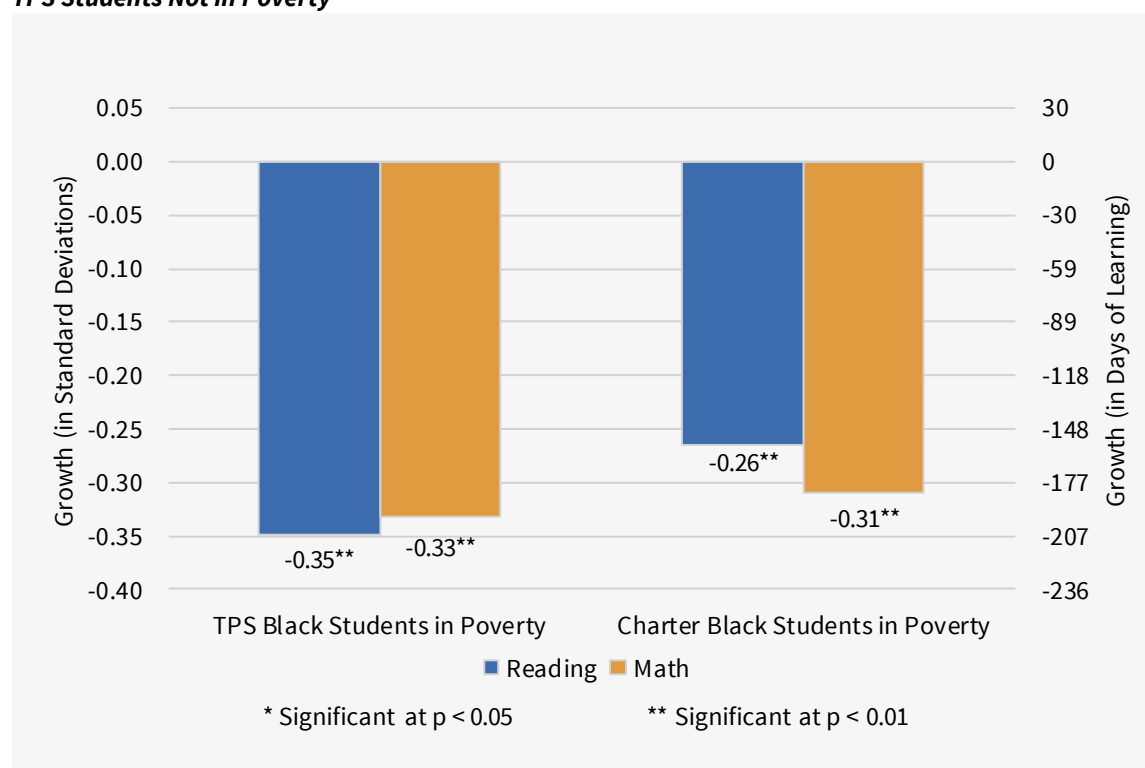
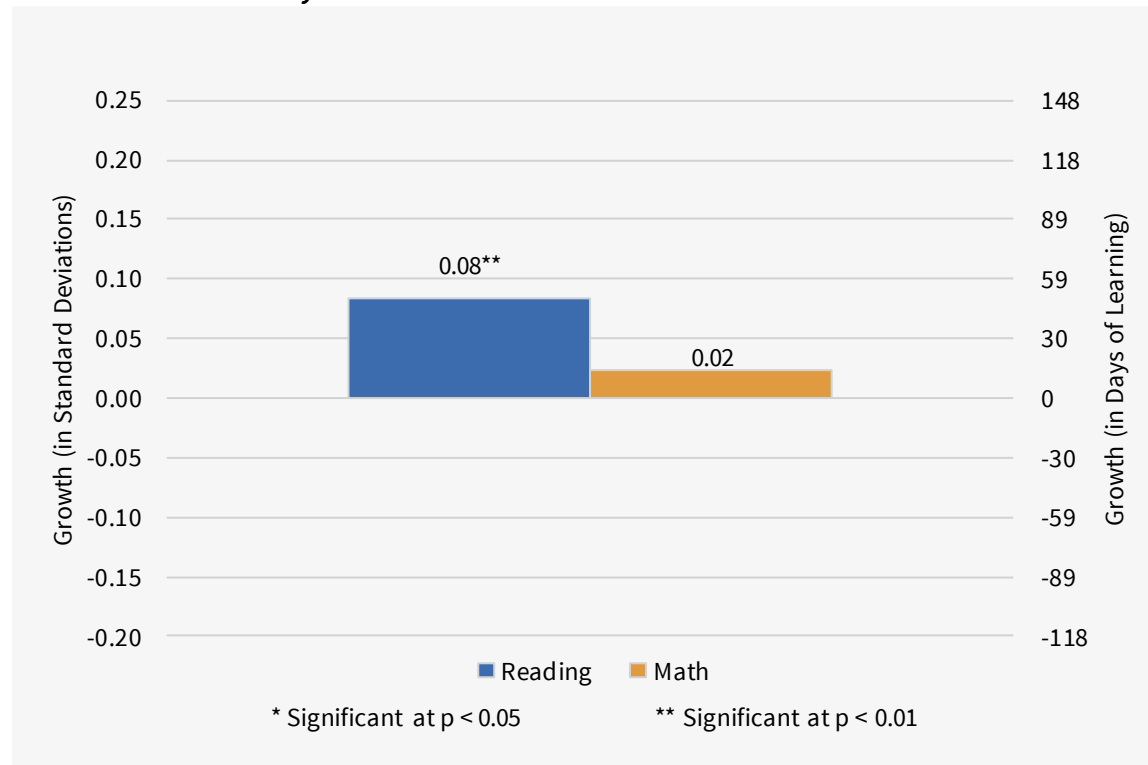


Figure 12 compares black students living in poverty, enrolled in TPS or charter schools, with the average white TPS student who is not in poverty. The patterns show that black students living in poverty, regardless of TPS or charter attendance, make less academic progress annually than white TPS students not living in poverty in Ohio. Black TPS students in poverty exhibit approximately 207 fewer days of learning in reading and 195 fewer days of learning in math than white non-poverty TPS students. Black charter students in poverty experience 153 fewer days of learning in reading and 183 fewer days in math than white non-poverty TPS students. The magnitude of the differences is noteworthy. They show the aggravated negative effect of the dual disadvantage status of these students.

When focusing on peer comparison as displayed in Figure 12a, we find that black students living in poverty experience a significant advantage in reading by attending charter schools. Black students in poverty enrolled in charter schools enjoy stronger growth per year in reading—equivalent to 47 additional days of learning—compared to black TPS students in poverty. In math, black charter students living in poverty make similar learning gains relative to their TPS peers.

Figure 12a: Relative Learning Gains for Black Charter School Students in Poverty Benchmarked against Their Black TPS Peers in Poverty



Hispanic students in poverty also have weaker performance in both reading and math than white TPS students who are not in poverty. As shown in Figure 13, Hispanic TPS students living in poverty experience a yearly average of 136 fewer days of learning in both reading and math than white non-poverty students in TPS. Hispanic students in poverty attending charter schools have, on average, 136 fewer days of learning in reading and 153 fewer days in math per year compared to TPS white students not living in poverty.

Figure 13: Learning Gains of Hispanic TPS and Charter Students in Poverty Compared to Learning Gains of White TPS Students Not in Poverty

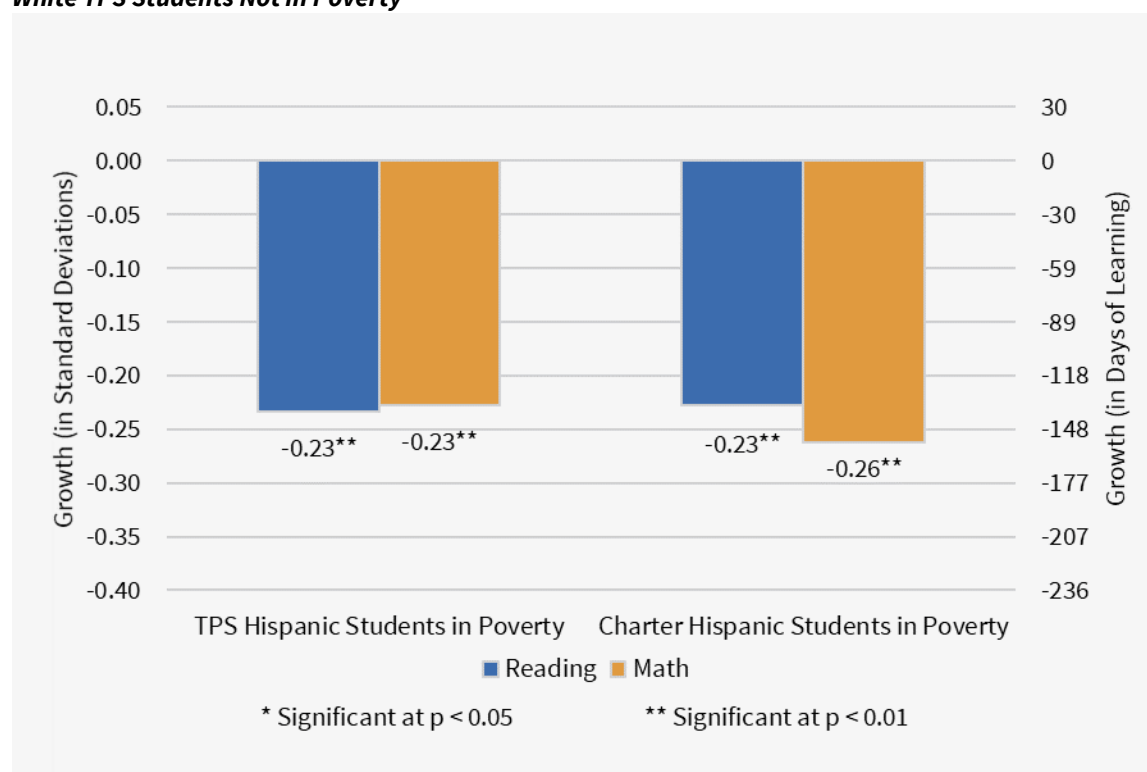
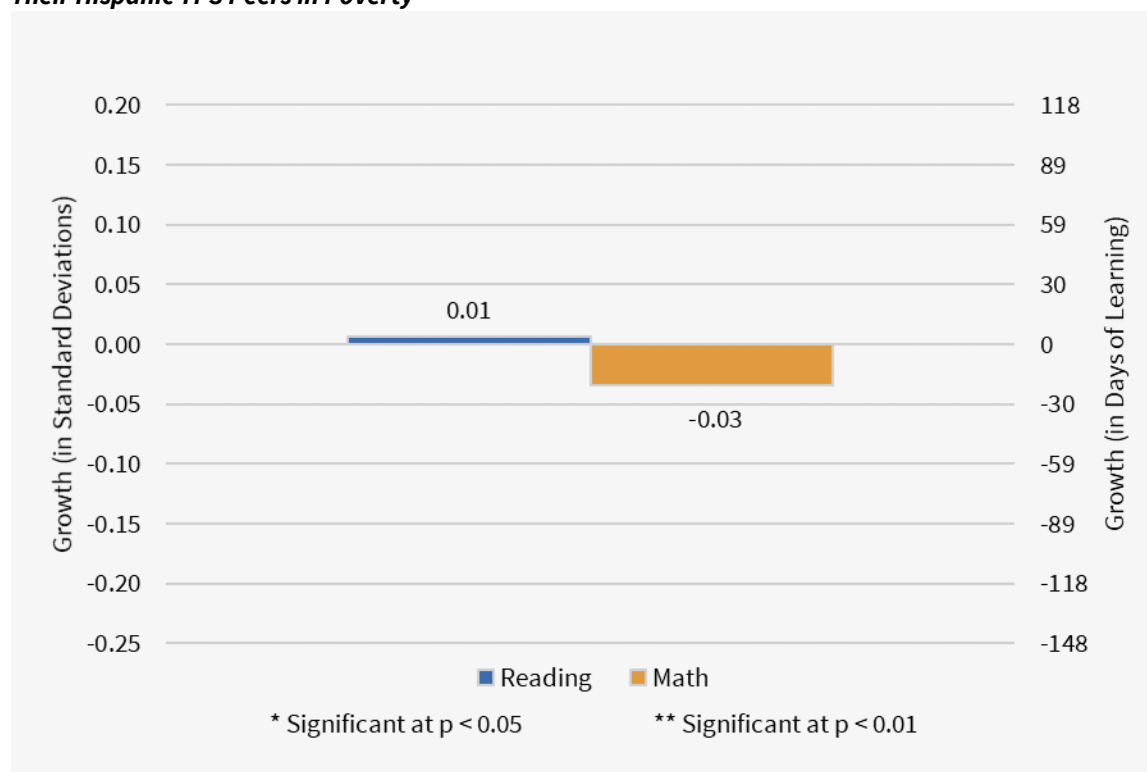


Figure 13a indicates that attendance in TPS or charter schools does not make a significant difference in the learning gains in either reading or math for Hispanic students living in poverty. Similar analysis in our 2014 Ohio study found Hispanic students in poverty who were in charter schools had weaker growth in math and similar growth in reading than their peer Hispanic students in poverty in TPS. The pattern in Figure 13a under the current study suggests charter schools in Ohio have made progress in serving Hispanic students living in poverty.

Figure 13a: Relative Learning Gains for Hispanic Charter School Students in Poverty Benchmarked against Their Hispanic TPS Peers in Poverty



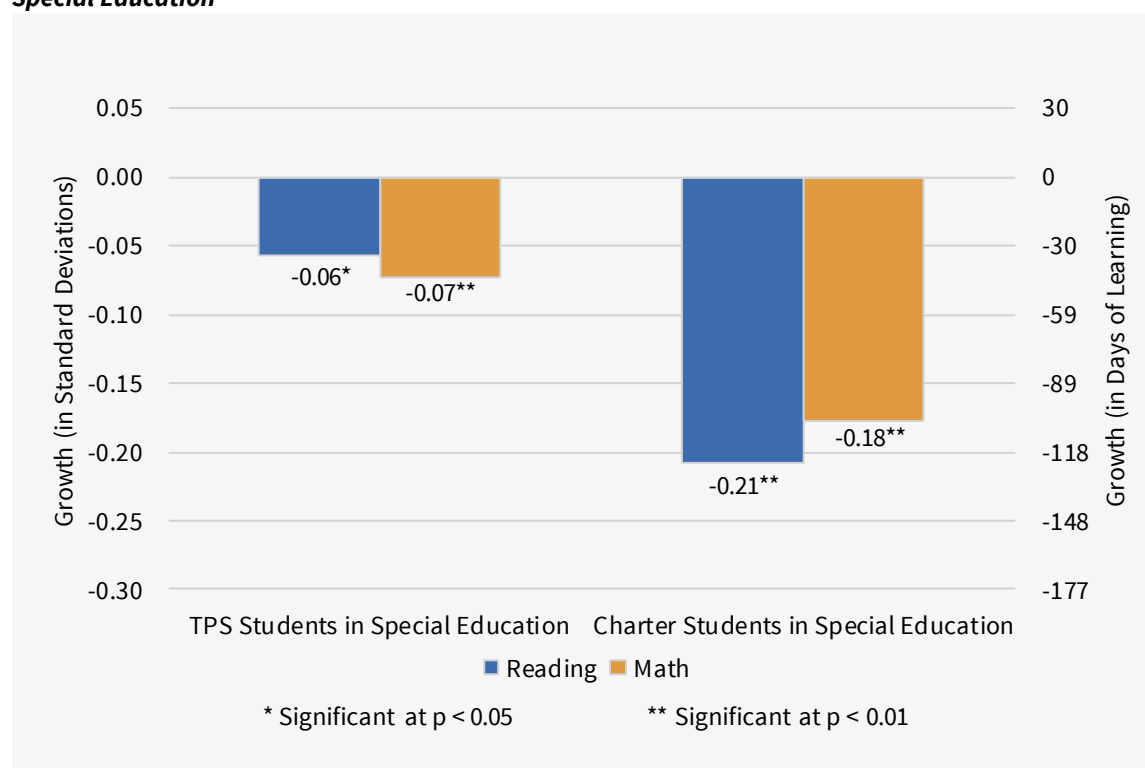
To summarize the findings illustrated in figures 12 through 13a, there are still huge performance gaps in both subjects between black and Hispanic students living in poverty (no matter where they study) and white non-poverty students in TPS. Charter schools produce more learning gains for black students in poverty in reading than occurs in TPS. However, charter or TPS enrollment does not affect the learning gains of Hispanic students in poverty in either subject, nor does it matter for math growth for black students in poverty.

Charter School Impact with Special Education Students

Because of the differences in individual needs, comparing the outcomes of special education students is difficult, regardless of where they enroll. In the ideal world, we would only compare students with the same Individual Education Program (IEP) designation, matching for it along with the rest of the matching variables. That approach faces real challenges, however, because of the large number of designations. The finer distinction leads to very small numbers of cases that match between charter schools and their feeder schools, which hinders the analysis. To obtain any estimates of charter school impacts for students with special education needs, it is necessary to aggregate across all IEP categories. It is important to consider this when viewing the results in Figure 14 and Figure 14a.¹⁷

¹⁷ In the analysis of students with special education needs, we only include those students who took regular (non-alternate) tests.

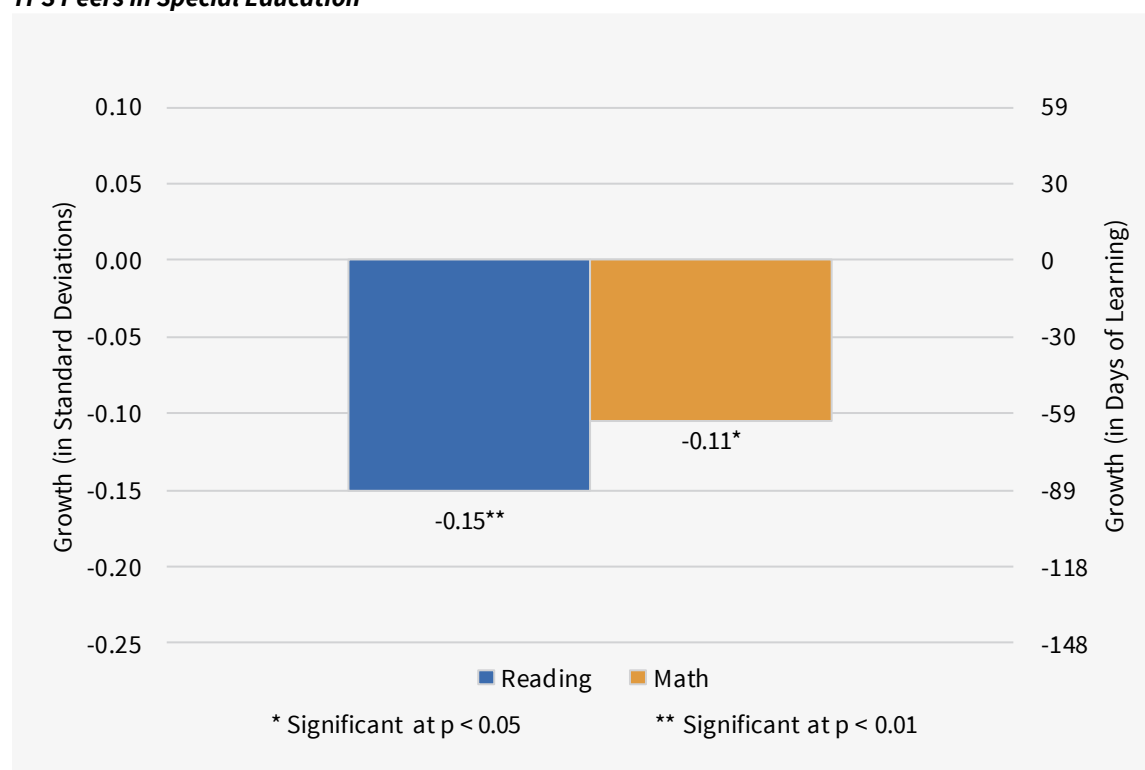
Figure 14: Learning Gains for TPS and Charter Students in Special Education Compared to TPS Students Not in Special Education



In Figure 14, the baseline for comparison is the TPS student who is not receiving special education services. Ohio special education students in both TPS and charter schools have significantly weaker academic growth than students in TPS who do not receive special education services. Figure 14 shows that TPS students in special education programs experience 35 fewer days of learning in reading and 41 fewer days of learning in math when compared to TPS students not receiving special education services. A special education student in charter schools also makes less progress than a non-special-education student in TPS and the gap is larger, reaching 124 fewer days of learning in reading and 106 fewer days in math.

Figure 14a contrasts the growth of special education students attending charter schools relative to their peers in TPS. The difference in the learning gains between the two groups of special education students disfavors charter school enrollment and is statistically significant for both subjects. Charter school enrollment is associated with 89 fewer days of learning in reading and 65 fewer days of learning in math per year for students with special education needs.

Figure 14a: Relative Learning Gains for Charter Students in Special Education Benchmarked against Their TPS Peers in Special Education

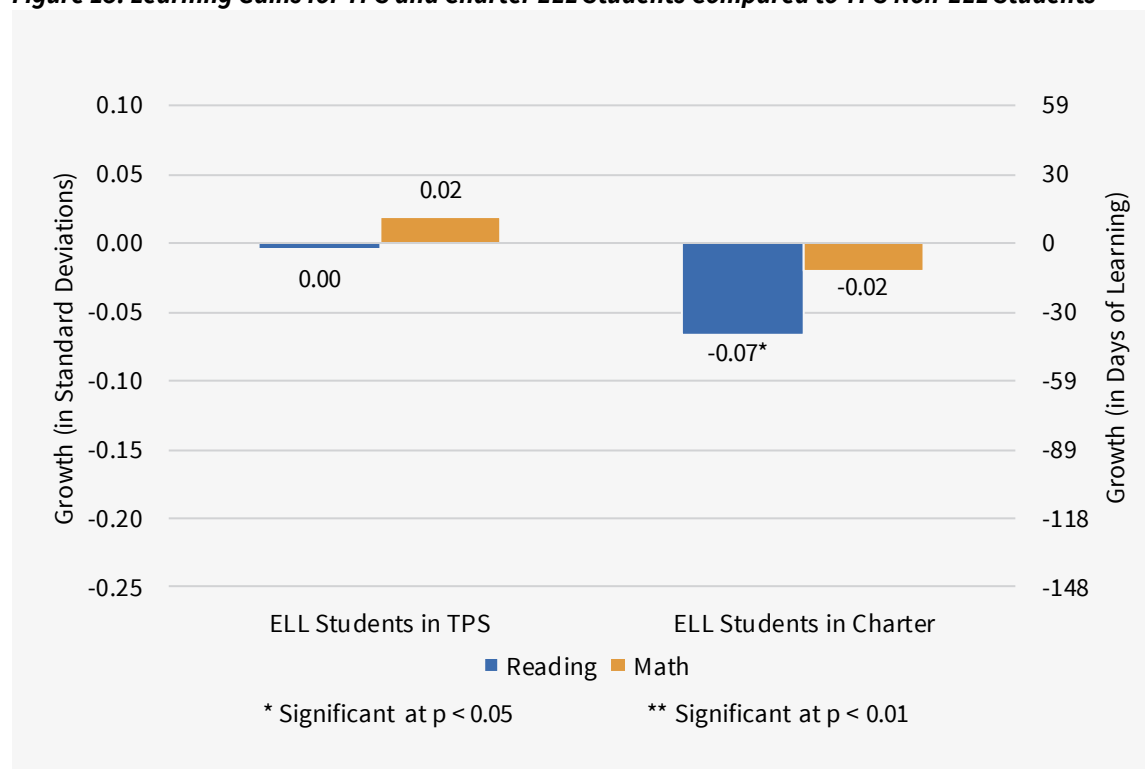


Charter School Impact with English Language Learners

There is a growing population of students enrolled in the public school system with a primary language other than English. Their present success in school will influence their progress in the future once they exit the school system. The 2017 National Assessment of Education Progress (NAEP) documented the performance gap between English language learners (ELLs) and their English-proficient peers, with ELL students having weaker performance.¹⁸ Even though the share of charter school students who are English Language Learners in Ohio is only 5 percent, demographic trends in the country point to larger shares over time. The analyses in Figure 15 and Figure 15a can provide important baselines for comparisons over time.

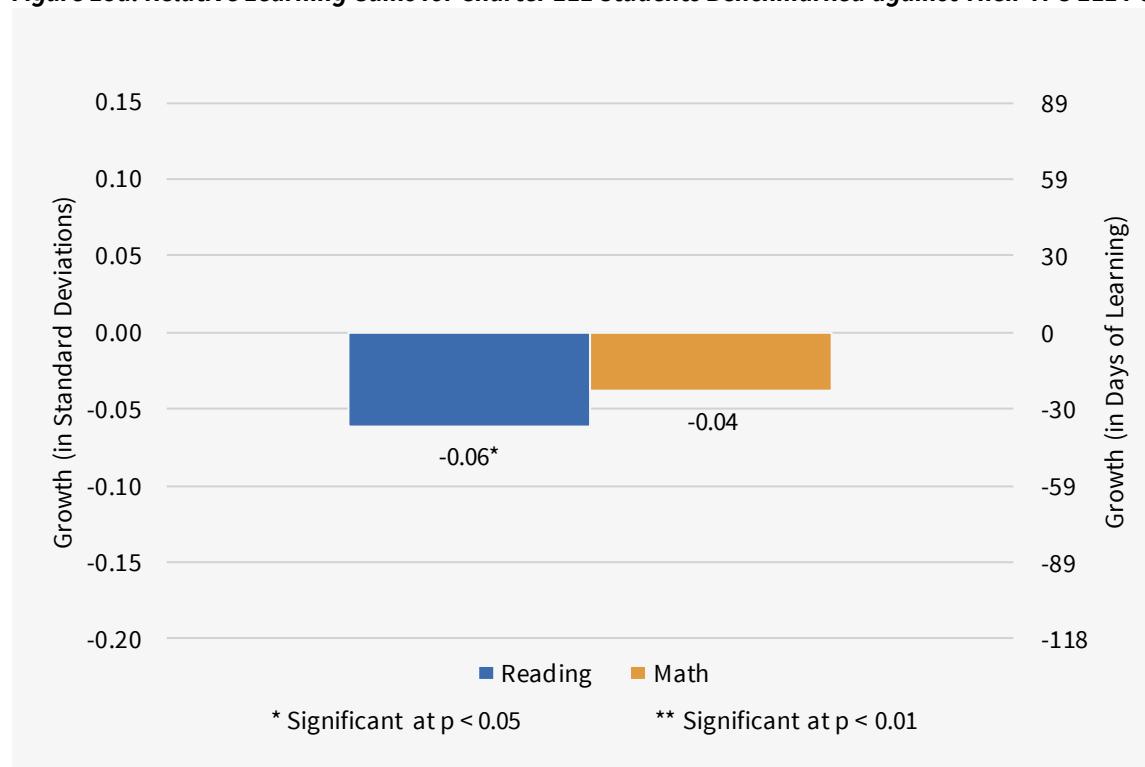
¹⁸ "National Student Group Scores and Score Gaps," NAEP Mathematics Report Card, https://www.nationsreportcard.gov/math_2017/nation/gaps/?grade=4#?grade=4.

Figure 15: Learning Gains for TPS and Charter ELL Students Compared to TPS Non-ELL Students



The comparison student for Figure 15 is a TPS student who is English-proficient. English language learners in TPS schools achieve comparable learning gains in both reading and math relative to non-ELL TPS students. Charter school students with ELL designation have 41 fewer days of learning in reading and no difference in math gains compared to non-ELL TPS students. When the progress in ELL students is compared across school settings, as displayed in Figure 15a, charter ELL students significantly lag behind their TPS ELL peers in reading by 35 days of learning while registering similar learning gains in math.

Figure 15a: Relative Learning Gains for Charter ELL Students Benchmarked against Their TPS ELL Peers

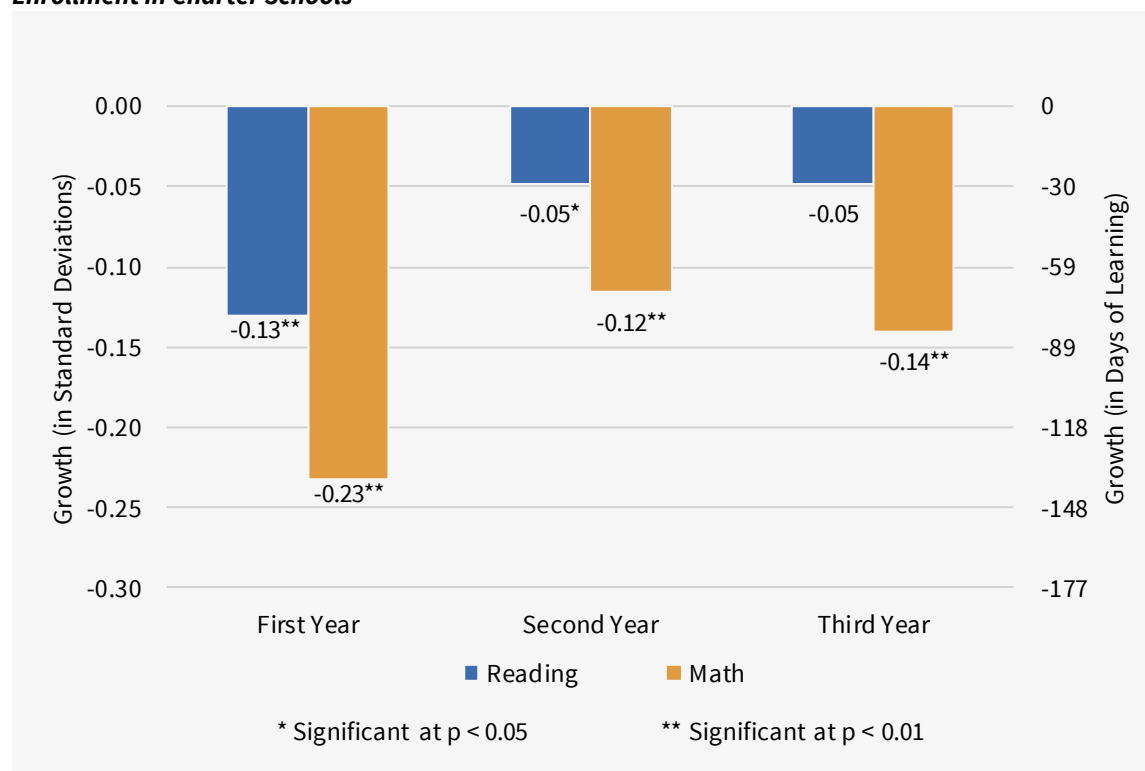


Charter School Impact by Students' Years of Enrollment

Students' academic growth may differ depending on how many years they enroll in a charter school. To test the relationship between progress and the length of enrollment in a charter school, we group separately test scores from students in the first year of charter enrollment, scores from students in their second year of charter attendance, and scores of students in their third year in a charter school. In this scenario, the analysis is limited to the charter students who enroll for the first time in a charter school between the 2014-15 and 2016-17 school years and their TPS VCRs. Although this approach reduces the number of students included, it ensures an accurate measure of the effect of continued enrollment over time. The results for this subset of the full study sample should not be directly compared with other findings in this report.

Figure 16 shows that new charter students in Ohio see initial reductions in learning gains in both subjects as compared to the average VCRs in TPS during the first year of enrollment in charter schools. The academic deficits between charter students and the average TPS VCRs decrease markedly in both reading and math in the second year of charter enrollment, but still hover in the negative spectrum. In the third year of attending charter schools, students catch up with the average TPS peers in reading while continuing to lag behind in math. Nevertheless, the relative disadvantage in math for charter students in the third year of charter enrollment remains smaller than that in the first year of entering a charter school.

Figure 16: Learning Gains of Charter Students Compared to Gains for Average TPS VCRs by Students' Years of Enrollment in Charter Schools



Our probing reveals that more than half of the students who go to a charter school for the first time in our data (54 percent for reading and 53 percent for math) are enrollees in online charter schools. As already depicted in Figure 8 and Figure 8a, the academic impact of online charter schools is markedly negative for both reading and math, which drags down the overall charter school impact on student progress. Hence, we further decompose the effects of the length of charter school enrollment on student growth shown in Figure 16 by delivery system (online vs. brick-and-mortar) and report the findings in Table 4.

Table 4: Learning Gains of Overall, Brick-and-Mortar, and Online Charter Students Compared to Average TPS VCRs by Students' Years of Enrollment in Charter Schools

	Overall Charter	Brick-and-Mortar Charter	Online Charter
Reading			
First Year of Enrollment in Charter	-0.13**	-0.04	-0.21**
Second Year of Enrollment in Charter	-0.05*	-0.01	-0.10**
Third Year of Enrollment in Charter	-0.05	0.00	-0.09**
Math			
First Year of Enrollment in Charter	-0.23**	-0.07*	-0.38**
Second Year of Enrollment in Charter	-0.12**	-0.02	-0.23**
Third Year of Enrollment in Charter	-0.14**	-0.09**	-0.20**

Note: * Significant at $p < 0.05$. ** Significant at $p < 0.01$.

The growth data in the “Overall Charter” column in Table 4 correspond to those in Figure 16. The results in the “Brick-and-Mortar Charter” and “Online Charter” columns, which are the focus of the disaggregation, exhibit poor math performance throughout the sector as well as distinct variations. Those attending brick-and-mortar charters in the first year of learning in the charter sector have similar gains in reading and weaker growth in math relative to the average TPS students up to three years of charter enrollment. In contrast, the students going to online charter schools in the first year of charter enrollment perform tremendously worse than the average TPS VCRs in both subjects up to three years of charter attendance and the gaps are larger in math than in reading. Apparently, the negative patterns in Figure 16 are driven by the poor performance of the students entering online charters in the first year of charter enrollment. Similar to the trajectory in Figure 16, the disadvantages for online charter students decrease along with the length of time staying in the charter sector, although their relative growth remains in the negative territory. Additional research is needed to explore the performance of students studying in charter schools for more than three continuous years.

7. School-level Analysis

The numbers reported in the previous sections represent the typical learning gains at the student level across the state; they reveal what would be the likely result if a typical student were enrolled in any of the Ohio charter schools. The prior results do not let us discern whether some charter schools are better than others. Since school-level results are of interest to policymakers, parents, and the general public, we aggregate charter student performance to the school level for each charter school in the state. This view is necessarily limited to charter schools with sufficient numbers of tested students to make a reliable inference on performance.

Comparative School-Level Quality

It is important to understand the counterfactual used in this section. As shown in Table 1 earlier in the report, the student populations within the typical charter school and their feeder schools differ, making whole-school to whole-school comparisons unhelpful. Here instead, we pool each school's VCRs to simulate "apples to apples" TPS school and to serve as the control condition for testing the performance of charter schools. This simulated TPS reflects a precise estimate of the alternative local option for the students actually enrolled in each charter school.

To determine the range of charter school performance, we estimate the annual learning impact of each charter school over the two most recent growth periods (2015-2016 and 2016-2017).¹⁹ The estimated learning impact for each charter school can be positive (statistically different from zero with a positive sign), negative (statistically different from zero with a negative sign), or zero. We use it to infer how the academic quality of a charter school compares to the quality of traditional public schools which students in that charter school would have potentially attended if they had not attended a charter school.

A statistically positive learning impact for a charter school suggests that the charter school has stronger learning growth than the alternative TPS options for its students. A statistically negative learning impact for a charter school implies the school makes less progress than the traditional schools its students would have attended. A zero learning impact means that the charter school and the TPS alternatives for its students have similar performance.

Our total sample consists of 159 schools with reading scores and 158 schools with math scores in the 2015-2016 and 2016-2017 growth periods.²⁰ Table 5 below shows the breakout of the performance for the included Ohio charter schools.

Table 5: Performance of Charter Schools Compared to TPS Alternatives in Ohio

Subject	Significantly Worse		Not Significantly Different		Significantly Better	
	Number	Percent	Number	Percent	Number	Percent
Reading	23	14%	82	52%	54	34%
Math	50	32%	62	39%	46	29%

¹⁹ We chose to include only the two most recent growth periods in this analysis in consideration of the dynamic growth within some charter schools and to provide the most contemporary picture of performance possible.

²⁰ As noted in Table 1, charter schools are smaller on average than their corresponding feeder schools. Furthermore, some charter schools elect to open with a single grade and mature one grade at a time. Consequently, care is needed when making school-level comparisons to ensure that the number of tested students in a school is sufficient to provide a fair representation of the school's impact. Our criterion for inclusion is at least 60 matched charter student records over the two growth periods or at least 30 matched charter records for schools with only one growth period.

In reading, 34 percent of Ohio charter schools perform significantly better than the traditional schooling environments the charter students would have otherwise attended. In math, 29 percent of charter schools perform significantly better than TPS alternatives. The result for reading is superior to the national average in our 2013 national study, where 25 percent of charter schools outperform their TPS counterparts, while the pattern for math is the same as the national average.²¹ When looking at weaker performance, 14 percent of Ohio charter schools have significantly weaker reading results than the local TPS option and 32 percent do so in math. Based on our 2013 national analysis, 19 percent of charter schools pale against the local TPS alternatives in reading and 31 percent do so in math. In reading, 52 percent of Ohio charter schools have results that do not differ significantly from TPS options in their communities. In math, 39 percent of charter schools have growth performance that is indistinguishable from their TPS alternatives. Based on these distributions, we infer that Ohio charter schools are performing slightly better than the national average at both ends of the comparison.

Growth and Achievement

While the impacts of charter schools on academic growth relative to their local competitors are informative, we are also interested in how well students perform in absolute terms. Since many of the students served by charter schools start at low levels of achievement, the combination of absolute achievement and relative growth is vital to understanding student success overall.

For each school, the tested achievement of its students over the same two periods covered by the academic growth analysis (2015-2016 and 2016-2017) is averaged and transformed to a percentile within the statewide distribution of

Graphics Roadmap 3

How to interpret the results in tables 6 and 7:

There are four quadrants in each table. We have expanded on the usual quadrant analysis by dividing each quadrant into four sections. The value in each box is the percentage of charter schools with the corresponding combination of growth and achievement. The value in the center of each quadrant is the sum of the four sections in that quadrant. These percentages are generated from the 2015-2016 and 2016-2017 growth periods.

The uppermost box on the left denotes the percentage of charters with very low average growth but high average achievement. The box in the bottom left corner depicts low-growth, low-achieving schools.

Similarly, the uppermost box on the right contains the percentage of charters with high average growth and high average achievement. The bottom right corner contains high-growth, low-achieving schools.

The major quadrants were delineated using national charter school data. We would expect the majority of schools to have an effect size between -0.15 and 0.15 standard deviations of growth (the two middle columns). Similarly, we would expect about 40 percent of schools to achieve between the 30th and 70th percentiles. These expectations are based on how we view a normal distribution with the majority of the sample falling within one standard deviation of the mean.

²¹ Cremata et al., *National Charter School Study 2013*.

achievement.²² The 50th percentile indicates statewide average performance for all public school students (traditional and charter). A school achievement level above the 50th percentile indicates that the school's overall achievement exceeds the statewide average. We use standard deviations discussed above to measure growth. We display each school's achievement and growth in a two-dimensional plot, displayed in Tables 6 and 7.

Table 6: School-Level Reading Growth and Achievement in Ohio Charter Schools

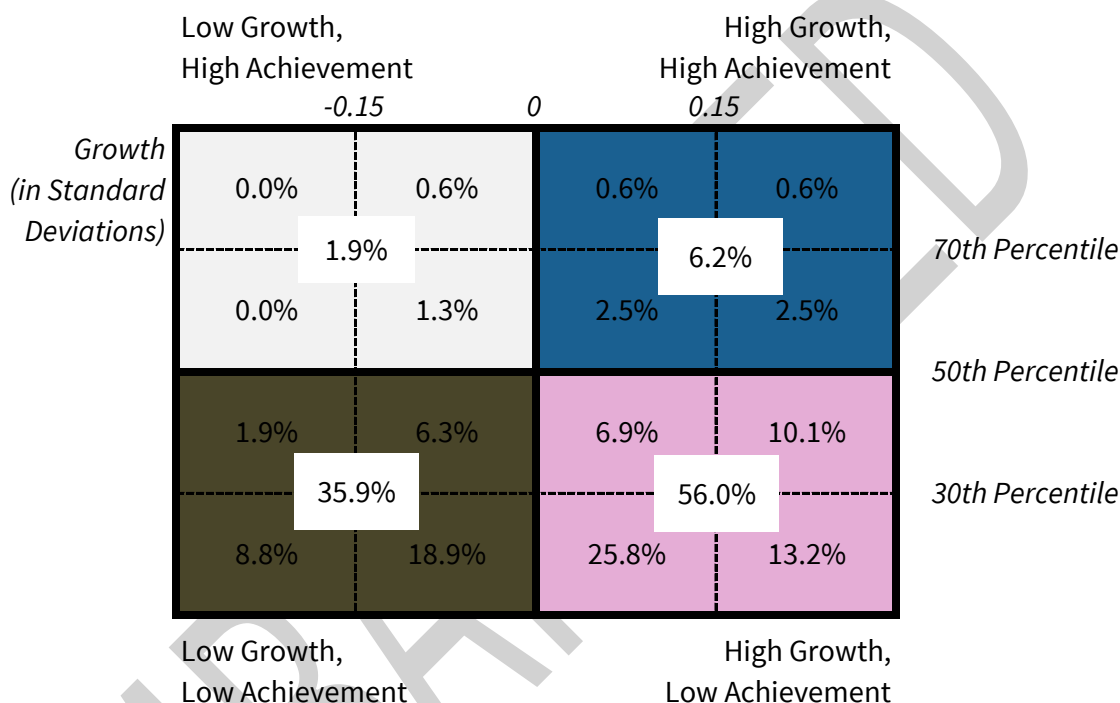


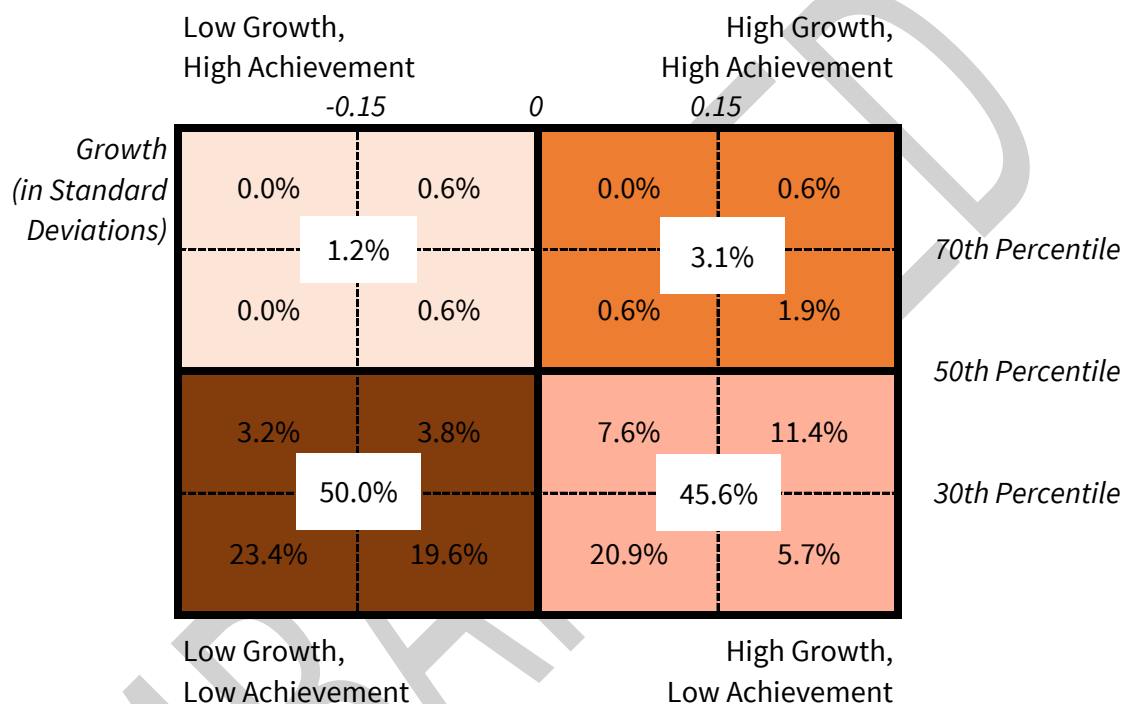
Table 6 presents the reading achievement and growth results for the Ohio charter schools included in this analysis. In the table, 99 of the 159 Ohio charter schools (62 percent) have positive average growth compared to their peer schools. (This percentage is the sum of the eight squares in the blue and pink quadrants in the right half of the table.) Only 6 percent of charters have positive growth and average achievement above the 50th percentile of the state (i.e., the total for the blue quadrant on the top right). A total of 56 percent of charter schools (i.e., the pink box) post above-average gains but remain below the state average in absolute achievement. Over time, if the 56 percent of charter schools (i.e., the pink box) maintain or improve their average growth, their achievement would increase, eventually moving them into the blue box.

Nearly 38 percent of schools post smaller learning gains than their peer TPS (the sum of gray and brown quadrants on the left half of the table). If their growth remains steady or worsens, they will fall in the

²² Average achievement was computed using students' z-scores from the end of the growth period (e.g., spring 2016 and spring 2017). The resulting school-level mean was then converted into a percentile.

overall distribution of achievement as other schools pull away. Approximately 92 percent of charters perform below the 50th percentile of achievement (the sum of the brown and pink cells in the lower portion of the table). The area of the greatest concern is the 36 percent of schools that fall into the lower left quadrant of the table. These schools are characterized by both low achievement and low growth.

Table 7: School-Level Math Growth and Achievement in Ohio Charter Schools



In math, 77 of the 158 Ohio charter schools (close to 49 percent) have positive average growth in math, as seen in the combined orange and pink quadrants in the right half of Table 7. About 3 percent of charters have positive growth and average achievement above the 50th percentile (the orange quadrant in the upper right of the table). Approximately 96 percent of charters post achievement results below the 50th percentile of the state for math (the sum of cells in the lower half of the table); these percentages are even larger than those presented in Table 6 for reading. In the pink quadrant in the lower right of the table, nearly 46 percent (72 schools) of the 158 schools classified as having low achievement have high growth and appear to be on an upward trajectory. As in the previous table, the schools of the greatest concern are those in the lower left (brown) quadrant that have both low achievement and low growth; they account for half (79 schools) of the charter schools in Ohio.

8. Analysis of Management Organizations

Many charter schools belong to management organizations. In this study, a management organization operates at least three separate charter schools and has administrative control of school operations. Management organizations have some operational advantages in their ability to spread administrative fixed costs over a larger number of schools or students, thus providing the possibility of greater efficiency (i.e., the cost per student or per school is lower). In addition, with more schools and students than a single charter school, management organizations may be able to support additional programs and more robust staffing.

Whether management organizations lead to better student outcomes is a matter of interest across the country. This analysis only includes charter schools located in Ohio that are associated with management organizations, even if an organization also operates schools in other states. As mentioned in previous sections, online charter schools have distinct features of not setting physical/geographic barriers, serving students with specific characteristics, and delivering curriculum online. Hence, we treat all online charters as a separate category in this analysis and divide brick-and-mortar charter schools into two subsectors: schools that are part of management organizations and independently operated charter schools.

As with prior analysis of the charter impact by online versus brick-and-mortar status, the benchmark for comparing the performance of students from the two charter subsectors is the annual academic growth of the average TPS VCR. The results are presented in Figure 17.

Figure 17: Student Learning Gains of Brick-and-Mortar Management Organizations and Brick-and-Mortar Independent Charter Schools Compared to Gains of Average TPS VCRs

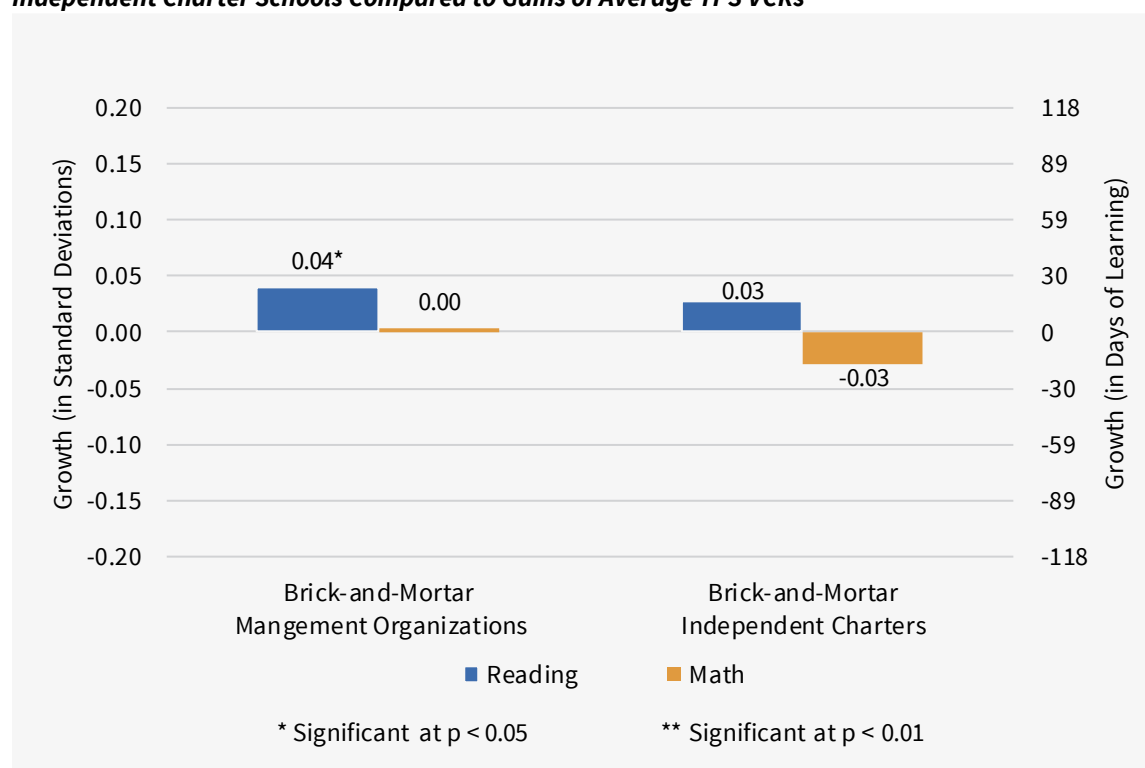
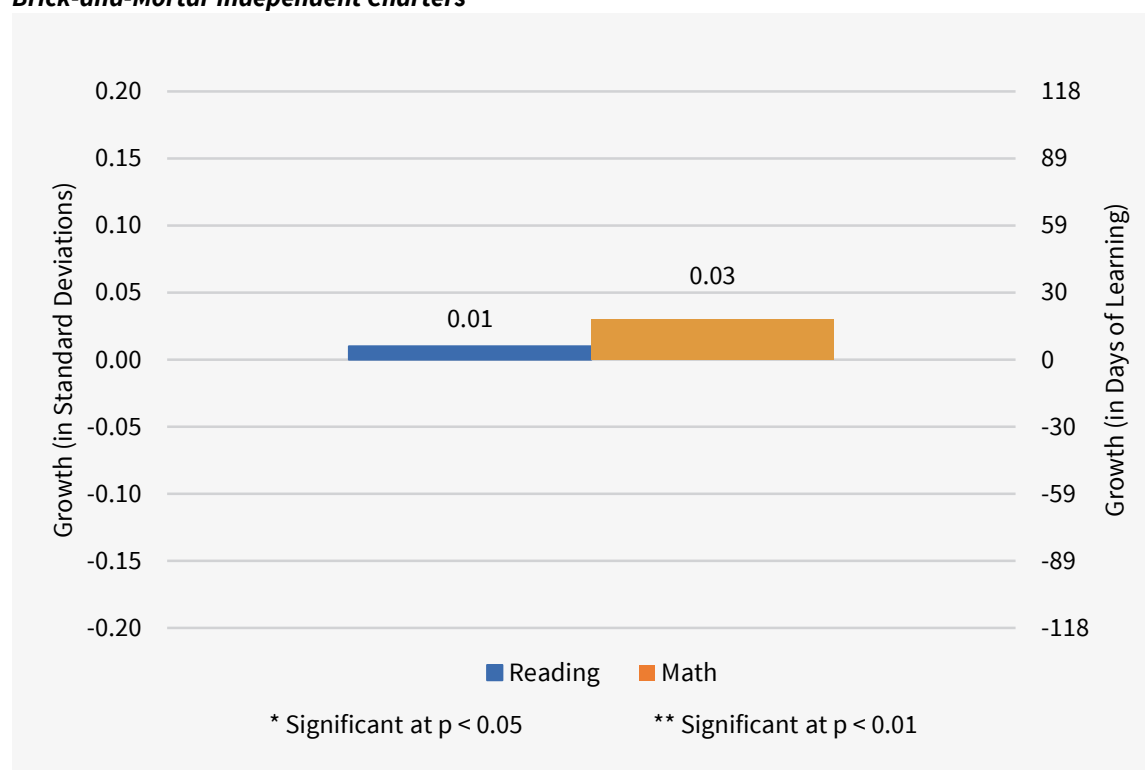


Figure 17 displays a significantly positive impact of management organizations on reading. Students attending a brick-and-mortar charter school affiliated with a management organization gain an annual edge in reading by 24 days of learning compared to average TPS students. Students enrolled in independent brick-and-mortar charters show similar growth in reading relative to average TPS VCRs. This breakdown analysis suggests that management-organization-operated charters contribute to the positive finding for reading for brick-and-mortar charter students observed in Figure 8. Whether a charter school is part of a management organization or operates independently does not make a significant difference in students' learning gains in math relative to the average TPS students.

We also compare the academic growth of the students from management-organization-operated charters with the progress of the enrollees in independent charters within the brick-and-mortar sphere. Figure 17a shows that students of charters operated by management organizations grow similarly as compared to students of independent charter schools in both reading and math.

Figure 17a: Learning Gains of Brick-and-Mortar Management Organizations Compared to Learning Gains of Brick-and-Mortar Independent Charters



Overall, management organizations benefit student learning more than TPS in reading. Nevertheless, students enrolled in charters operated by management organizations do not exhibit significant advantages or disadvantages over students attending independent charter schools in either subject.

9. Synthesis and Conclusions

Summary of Major Findings

In this study, we examine the one-year academic progress of students in Ohio charter schools compared to the gains of identical students in the traditional public schools the students otherwise would have attended. The study employs four years of annual data ending in the 2016-2017 school year, which are used to create three year-to-year measures of progress. The year-to-year measure is referred to as growth or gains. Table 8 presents a summary of the results from the various analyses in this report.

Table 8: Summary of Analysis Findings for Ohio Charter School Students Benchmarked against Comparable TPS Students

	Reading	Math
Ohio Charter Students	Similar	Negative
Students in Charters in 2014-2015	Similar	Negative
Students in Charters in 2015-2016	Positive	Similar
Students in Charters in 2016-2017	Similar	Negative
Students in Urban Charter Schools	Similar	Similar
Students in Suburban Charter Schools	Similar	Negative
Students in Town Charter Schools	Negative	Negative
Students in Rural Charter Schools	Similar	Similar
Students in Elementary Charter Schools	Positive	Similar
Students in Middle School Charter Schools	Positive	Positive
Students in High School Charter Schools	Similar	Negative
Students in Multi-level School Charter Schools	Negative	Negative
Students in First Year Enrolled in Charter School	Negative	Negative
Students in Second Year Enrolled in Charter School	Negative	Negative
Students in Third Year Enrolled in Charter School	Similar	Negative
Black Charter School Students	Positive	Positive
Hispanic Charter School Students	Similar	Similar
Charter School Students in Poverty	Similar	Negative
Black Charter School Students in Poverty	Positive	Similar
Hispanic Charter School Students in Poverty	Similar	Similar
Special Education Charter School Students	Negative	Negative
English Language Learner Charter School Students	Negative	Similar
Students in Online Charter Schools	Negative	Negative
Students in Brick-and-Mortar Charter Schools	Positive	Similar
Students in Brick-and-Mortar Management Organizations	Positive	Similar
Students in Brick-and-Mortar Independent Charter Schools	Similar	Similar

On average, students in Ohio charter schools experience similar learning gains in reading and weaker growth in math in a year than their TPS peers. The disadvantage in math for charter students is as if the students lose 41 days of learning in a school year. Over the three growth periods, the annual gains of students in Ohio charter schools fluctuated, possibly due to multiple testing changes adopted during the time.

Beyond the overall results, the analysis probed the consistency of charter school performance in Ohio over many dimensions. Urban and rural charter school students grow similarly to their TPS VCRs in both reading and math. Students enrolled in suburban charter schools achieve comparable gains in reading and weaker growth in math compared to their TPS virtual twins. Attendance in charter schools in towns is associated with learning losses in both subjects.

Comparison of charter performance by school grade configuration found that students in Ohio charter elementary and middle schools exhibit stronger growth in reading as compared to their TPS VCRs. Charter middle school students also gain an edge over their TPS virtual twins in math. However,

students in charter high schools experience weaker growth in reading than their TPS VCRs and students in multi-level charters lag substantially behind their virtual twins in TPS in both reading and math.

The results for demographic subgroups vary during the span of the study. Stronger growth is found for black students in both reading and math, amounting to 59 additional days of learning in reading and 24 extra days of learning in math, when benchmarked against their TPS peers. Hispanic students obtain similar learning gains in both subjects as compared to their virtual twins in TPS. Charter school attendance disadvantages students living in poverty by 30 fewer days of learning in math. However, black students in poverty post greater gains in reading, equivalent to 47 extra days of learning, than their TPS virtual twins. Charter English language learners grow less in reading and charter special education students gain less in both subjects than their peers enrolled in comparable TPS.

In Ohio, there are different types of operation for charter schools. Online and brick-and-mortar charters have distinct physical or geographic boundaries, student profiles, and means of curriculum delivery. Our investigation reveals remarkably weaker growth in both reading and math among online charter students relative to the average TPS VCRs or brick-and-mortar charter students. In fact, the poor performance of online charter schools drags down the overall charter impact on student academic growth.

When the impact of brick-and-mortar charters is further decomposed by subsector, students attending charters operated by management organizations post greater gains than the average TPS students in reading. In math, students experience similar growth relative to the average TPS VCRs regardless of whether their schools are part of management organizations or operated independently. Within the brick-and-mortar realm, independent charter schools are on a par with management organizations in terms of student progress.

Looking at the results at the school level, around one third of Ohio charter schools outpace their local TPS peers in learning in reading and math. Still, 14 percent of charter schools have results that are significantly worse than TPS for reading and 32 percent of charter schools are underperforming in math relative to their local TPS peers.

The student-to-student and school-to-school results show variations in the academic impact of charter schools as compared to comparable TPS. The complementary question of whether charter schools are helping students achieve at high levels is also important. More than 90 percent of charter schools in Ohio fall below the 50th percentile in achievement in both reading and math. These outcomes are of course influenced by locational decisions and the starting points of the students they serve. In addition, 62 percent of charter schools have positive academic growth in reading and close to half of charter schools have positive academic growth in math irrespective of achievement. Some schools below the 50th percentile of achievement have positive growth in reading and math. With positive and sustained growth, these schools will likely post achievement gains over time. However, the outlook for a large proportion of charter schools with below-average growth *and* low achievement (36 percent for reading

and 50 percent for math) is a source of great concern in Ohio. Students in these schools will fall further behind their TPS peers in the state academically over time if their negative growth persists.

Implications

Several implications for charter school policies in Ohio emerge from this study.

There is little to no progress in Ohio charter school performance since the 2009 study. Although they grow similarly in reading relative to comparable TPS students, Ohio charter school students still lag in math during the period of this study and the gap has virtually not narrowed over time. More work is needed to ensure that charter schools serve their students well.

Varying performance within the Ohio charter sector provides important experiences and lessons. Stronger performance found among black charter students (including black students in poverty), students attending elementary or middle schools, and students in charters operated by management organizations is evidence that quality education can be expanded to help students achieve their long-term goals. The study also found important differences in performance across schools. Dozens of Ohio charter schools post learning gains that outpace the local TPS performance for the same students. Considering the fact that charters serve a more academically challenged student population than their TPS peer schools or the state as a whole, these results hold considerable learning potential for policy and practice. Sharing and replicating successful practices can help students who do not perform well, including special education students, English language learners, and students living in poverty, as well as the overall charter sector in Ohio. Further research—for example, analysis using other outcome measures—can be pursued to help improve our understanding of the positive results shown in this study and to inform continuous improvement of Ohio public schools.

At the other end of the performance spectrum, greater focus is needed to address charter schools that produce substantially inferior results, such as online charter schools, multi-level charters, and charter schools in towns. Urgent attention should be accorded to the schools that post smaller academic gains and below-the-state-average achievement. It takes only a few years of poor academic progress to hinder a student for the rest of the K-12 experience. Rigorous and consistent accountability policies need to be adopted and executed to hold schools accountable for the academic outcomes of their students.

What is encouraging is that the state legislature and the Ohio Department of Education have demonstrated their intentions through legislative and regulatory changes. During the span of this study, new charter school openings decreased, an indication of decision-makers' caution of not letting quantity prevail over quality. The passing of HB 2 in October 2015 marked a particular breakthrough. The charter school bill emphasizes academic quality as a priority. The window of the current study ends in the school year 2016-2017; there might not have been sufficient time for the academic impact of HB 2 to develop. It is worth tracking how well the stipulations in the bill are implemented in practice and

how the bill, together with other changes in the education landscape in Ohio, affects student learning outcomes in the long term.

EMBARGOED

Appendix A. Number of Observations for All Results

The numbers in the table below represent the number of charter observations associated with the corresponding results in the report. An equal number of VCRs were included in each analysis.

Appendix Table 1: Number of Observations for All Results

Student Group	Matched Charter Student Records	
	Reading	Math
Ohio Charter Students Tested & Matched	58,501	54,478
Students in Charters in 2014-2015	13,437	12,766
Students in Charters in 2015-2016	21,031	19,281
Students in Charters in 2016-2017	24,033	22,431
Students in Urban Charter Schools	41,997	39,542
Students in Suburban Charter Schools	13,963	12,706
Students in Town Charter Schools	2,288	2,033
Students in Rural Charter Schools	253	197
Students in Elementary Charter Schools	26,142	25,823
Students in Middle School Charter Schools	4,089	4,021
Students in High School Charter Schools	1,833	1,166
Students in Multi-level School Charter Schools	26,437	23,468
Students in First Year Enrolled in Charter School	11,332	10,368
Students in Second Year Enrolled in Charter School	2,871	2,586
Students in Third Year Enrolled in Charter School	710	621
Black Charter School Students	30,422	28,999
Hispanic Charter School Students	2,576	2,466
White Charter School Students	22,613	20,325
Charter School Students in Poverty	45,614	42,914
Black Charter School Students in Poverty	28,024	26,722
Hispanic Charter School Students in Poverty	2,163	2,106
Special Education Charter School Students	649	551
English Language Learner Charter School Students	887	824
Students in Online Charter Schools	17,077	14,963
Students in Brick-and-Mortar Charter Schools	41,424	39,515
Students in Brick-and-Mortar Management Organizations	29,088	27,981
Students in Brick-and-Mortar Independent Charter Schools	12,336	11,534
Grade Repeating Charter School Students	1,088	904

Appendix B. Technical Appendix

Match Rates for Ohio Charter School Students with Feeder List Restricted and Not Restricted

In the Study Approach chapter, we explain that the United States Department of Agriculture phased in the Community Eligibility Provision (CEP) in Ohio and other states during the study period. The CEP allows schools and local education agencies with a minimum Identified Student Percentage (40 percent or more) to provide free breakfast and lunch to all students. To minimize over-identification of students living in poverty in the analysis, we drop from the list of feeder schools a very small number of TPS if their share of students identified as economically disadvantaged by the state was 100 percent *and* represented a jump by 35 percentage points or more from the previous year. As Appendix Table 2 shows, restricting the feeder list did not affect the percentage of charter students for whom a VCR match was possible.

Appendix Table 2: Match Rates for Tested Charter School Student Observations in Ohio with Feeder List Restricted and Not Restricted

	Reading	Math
Match Rate With Full Feeder List	72%	71%
Match Rate With Feeder List Restricted	72%	70%

Note: The feeder list with restriction does not include a very small number of TPS feeders whose share of economically disadvantaged students was 100 percent and represented a jump by 35 percentage points or more from the previous year.

Demographic Composition of Charter Students in the Study

This study examines the performance of students in charter schools who participated in annual accountability testing in Ohio, occurring in grades 3-8 and in whatever grade the end-of-course (EOC) assessments were taken. The test scores allow us to use a common measure of performance across schools and over time. However, in each growth period of the study, students who are enrolled in non-tested grades are not included in the analysis of performance. This partially accounts for the differences in school and student counts in our analysis data compared to other published figures about the charter school population in Ohio.

As discussed in the Study Approach chapter, we match tested charter students by period if they can be tracked for two or three periods in the study so as to conform to the new baseline equivalence requirement in the *Procedures Handbook Version 4.0* of What Works Clearinghouse. Appendix Tables 3 to 5 present the student profiles of all and matched Ohio charter students tested in math in each matching period.

Appendix Table 3: Demographic Composition of Charter Students in the Study: Period 1

Student Group	All Charter Students Tested		Matched Charter Students	
	Number	Percent	Number	Percent
Ohio Charter Students	48,974		33,478	
% Matched	68%			
Black Students	24,436	50%	16,943	51%
Hispanic Students	3,571	7%	1,486	4%
White Students	17,544	36%	13,338	40%
Students in Poverty	38,875	79%	25,964	78%
Special Education Students	1,664	3%	423	1%
English Language Learners	1,778	4%	600	2%
Grade Repeating Students	3,709	8%	758	2%

Appendix Table 4: Demographic Composition of Charter Students in the Study: Period 2

Student Group	All Charter Students Tested		Matched Charter Students	
	Number	Percent	Number	Percent
Ohio Charter Students	21,082		15,372	
% Matched	73%			
Black Students	11,203	53%	8,645	56%
Hispanic Students	1,508	7%	680	4%
White Students	6,861	33%	5,300	34%
Students in Poverty	16,891	80%	12,277	80%
Special Education Students	424	2%	110	1%
English Language Learners	495	2%	170	1%
Grade Repeating Students	644	3%	121	1%

Appendix Table 5: Demographic Composition of Charter Students in the Study: Period 3

Student Group	All Charter Students Tested		Matched Charter Students	
	Number	Percent	Number	Percent
Ohio Charter Students	7,566		5,628	
% Matched	74%			
Black Students	4,351	58%	3,411	61%
Hispanic Students	588	8%	300	5%
White Students	2,117	28%	1,687	30%
Students in Poverty	6,222	82%	4,673	83%
Special Education Students	84	1%	18	0%
English Language Learners	136	2%	54	1%
Grade Repeating Students	146	2%	25	0%

Comparison of Starting Scores of Matched Students and VCRs

The VCR method used in this study of Ohio provided matches for 72 percent of tested charter students with growth scores in reading and matches for 70 percent of tested charter students with growth scores in math. To assess the quality of the matches, we compare the starting scores of matched charter students and the Virtual Control Records obtained from the matches in both reading and math. The statistical tests of equality of means are shown in Appendix Figures 1 and 2 for math and reading, respectively. We find that the starting scores of matched students and the virtual twins used as points

of comparison are almost identical. As matched students and their virtual twins have identical starting points in terms of learning in the beginning of a growth period, we can be confident that any difference in their final scores and therefore their learning growth can be attributed to charter school attendance, as the only observed way in which matched students and VCRs differ is that the former attend a charter school while the latter consist of students attending a traditional public school.

Appendix Figure 1: Comparison of Starting Math Scores of Matched Charter Students and VCRs

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Matched	54,478	-.5714982	.0035793	.835417	-.5785136	-.5644828
VCR	54,478	-.5717442	.0035737	.8341149	-.5787486	-.5647398
combined	108,956	-.5716212	.0025289	.8347624	-.5765779	-.5666645
diff		.000246	.0050579		-.0096674	.0101594
diff = mean(Matched) - mean(VCR)				t =	0.0486	
Ho: diff = 0				Welch's degrees of freedom =	108956	
Ha: diff < 0		Ha: diff != 0		Ha: diff > 0		
Pr(T < t) = 0.5194		Pr(T > t) = 0.9612		Pr(T > t) = 0.4806		

Appendix Figure 2: Comparison of Starting Reading Scores of Matched Charter Students and VCRs

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Matched	58,501	-.4296879	.0036036	.8716103	-.436751	-.4226247
VCR	58,501	-.4295272	.0035998	.870686	-.4365828	-.4224715
combined	117,002	-.4296075	.0025468	.8711446	-.4345992	-.4246158
diff		-.0001607	.0050936		-.0101441	.0098227
diff = mean(Matched) - mean(VCR)				t =	-0.0315	
Ho: diff = 0				Welch's degrees of freedom =	117002	
Ha: diff < 0		Ha: diff != 0		Ha: diff > 0		
Pr(T < t) = 0.4874		Pr(T > t) = 0.9748		Pr(T > t) = 0.5126		

Measuring Academic Growth

With four years of data, each subject-grade-year group of scores has slightly different mid-point averages and distributions. For end-of-course assessments (EOCs) there are only subject-year groups because EOCs are not grade-specific. This means a student takes this assessment after completing the course, no matter what grade he or she is in. In our study, scores for all these separate tests are transformed to a common scale. All test scores have been converted to standardized scores to fit a bell curve in order to allow for year-to-year computations of growth.²³

When scores are standardized, every student is placed relative to their peers in the entire state of Ohio. A student scoring in the 50th percentile in Ohio receives a standardized score of zero, while a standardized score of one would place a student in the 84th percentile. Students who maintain their relative place from year to year would have a growth score of zero, while students who make larger gains relative to their peers will have positive growth scores. Conversely, students who make smaller academic gains than their peers will have negative growth scores in that year.

Models for Analysis of the Charter School Impact

After constructing a VCR for each charter student, we then set out to develop a model capable of providing a fair measure of charter impact. The National Charter School Research Project provided a very useful guide to begin the process.²⁴ First, it was useful to consider student growth rather than achievement. A growth measure provided a strong method to control for each student's educational history as well as the many observable differences between students that affect their academic achievement. The baseline model included controls for each student's grade, race, gender, poverty status, special education status, English language learner status, and whether the student was held back the previous year. The literature on measuring educational interventions found that the best estimation techniques must also include controls for the baseline test.²⁵ Each student's prior year test score is controlled for in our baseline model. Additional controls are also included for year and period (first year in charter, second year in charter, etc.). The study's baseline model is presented below.

$$\Delta A_{i,t} = \theta A_{i,t-1} + \beta X_{i,t} + \rho Y_t + \gamma C_{i,t} + \varepsilon_{i,t} \quad (1)$$

²³ For each subject-grade-year set of scores, scores are centered around a standardized midpoint of zero, which corresponds to the actual average score of the test before transformation. Then each score of the original test is recast as a measure of variation around that new score of zero, so that scores that fall below the original average score are expressed as negative numbers and those that are higher receive positive values.

²⁴ Julian Betts and Paul Hill, "Key Issues in Studying Charter Schools and Achievement: A Review and Suggestions for National Guidelines," National Charter School Research Project, White Paper Series No. 2, May 2006.

²⁵ Julian Betts and Y. Emily Tang, "The Effect of Charter Schools on Student Achievement: A Meta-Analysis of the Literature," National Charter School Research Project, October 2011.

where the dependent variable is

$$\Delta A_{i,t} = A_{i,t} - A_{i,t-1} \quad (2)$$

and $A_{i,t}$ is the state-by-test z-score for student i in period t , $A_{i,t-1}$ is the state-by-test z-score for student i in period $t - 1$, $X_{i,t}$ is a set of control variables for student characteristics and period, Y_t is a year fixed effect, $C_{i,t}$ is a vector of variables for whether student i attended a charter school and what type of charter school in period t , and $\epsilon_{i,t}$ is the error term. Errors are clustered around charter schools and their feeder patterns as well.

In addition to the baseline model above, we explored interactions beyond a simple binary to indicate charter enrollment. These included both “double” and “triple” interactions between the charter variable and student characteristics. For example, to identify the impact of charter schools on different racial groups, we estimate models that break the charter variable into “charter_black,” “charter_Hispanic,” etc. To further break down the impact of charters by race and poverty, the variables above were split again. For example, black students in charter schools are split further into students who live in poverty (“charter_black_poverty”) and those who do not (“charter_black_nonpoverty”).

Presentation of Results

In this report, we present the impacts of attending charter schools in terms of standard deviations. The base measures for these outcomes are referred to in statistics as z-scores. A z-score of 0 indicates the student’s achievement is average for his or her grade. Positive values represent higher performance while negative values represent lower performance. Likewise, a positive effect size value means a student or group of students has improved relative to the students in the state taking the same exam. This remains true regardless of the absolute level of achievement for those students. As with the z-scores, a negative effect size means the students have on average lost ground compared to their peers.

It is important to remember that a school can have a positive effect size for its students (students are improving) but still have below-average achievement. Students with consistently positive effect sizes will eventually close the achievement gap if given enough time; however, such growth might take longer to close a particular gap than students spend in school.

While it is fair to compare two effect sizes relationally (i.e., 0.08 is twice 0.04), this must be done with care as to the size of the lower value. It would be misleading to state one group grew twice as much as another if the values were extremely small, such as 0.0001 and 0.0002.

Finally, it is important to consider whether an effect size is significant or not. In statistical models, values which are not statistically significant should be considered as no different from zero. Two effect sizes, one equal to .001 and the other equal to .01, would both be treated as no effect if neither were statistically significant.

To assist the reader in interpreting the meaning of effect sizes, we include an estimate of the average number of days of learning required to achieve a particular effect size. This estimate was calculated by Dr. Eric Hanushek and Dr. Margaret Raymond based on the latest (2017) 4th and 8th grade test scores from the National Assessment of Educational Progress (NAEP). Using a standard 180-day school year, each one standard deviation (s.d.) change in effect size was equivalent to 590 days of learning in this study. The values in Table 3 are updated from past reports using more recent NAEP scores, which show slower absolute annual academic progress than earlier administrations.²⁶

In order to understand “days of learning,” consider a student whose academic achievement is at the 50th percentile in one grade and also at the 50th percentile in the following grade the next year. The progress from one year to the next equals the average learning gains for a student between the two grades. That growth is fixed as 180 days of effective learning based on the typical 180-day school year.

We then translate the standard deviations of growth from our models based on that 180-day average year of learning, so that students with positive effect sizes have additional growth beyond the expected 180 days of annual academic progress while those with negative effect sizes have fewer days of academic progress in that same 180-day period.

²⁶ Hanushek, Peterson, and Woessmann, “Achievement Growth: International and U.S. State Trends in Student Performance.”